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THE METAPHYSICS

OF

THE SCHOOL

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THE METAPHYSICS

OF

THE SCHOOL

BY
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THOMAS HARPER
S. J.

VOL. III.

(PART I.)

οὐ γάρ τι νῦν γε κἀχθὲς, ἀλλ' ἀεί ποτε
ζῇ ταῦτα, κοὐδεὶς οἶδεν ἐξ ὅτου 'φάνη.

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PREFACE.

THE author owes to his readers an explanation of the reasons, why he has felt compelled to divide the present Volume into two Parts, and to divide it in the way which he has chosen.

This third Volume is intended to conclude the *fifth* Book on *the Causes of Being*. It was found impossible to do this within the normal limits of a single Volume, which would have embraced, at least, a thousand pages. The Discussions on *Free-will*, which will form the commencement of the *second Part* of this Volume, will alone occupy from three to four hundred pages; and there remain the Chapters on *the Final Cause*, *the Exemplar Cause*, and on *the mutual relation of these Causes to each other*, *their subordination*, *etc.*

The reason why he has adopted the present division, is twofold. First: If he had admitted the Discussions on Free-will into this Part; there would have been too great a disproportion between the two Parts. Secondly: It seemed advisable to give due prominence to a question of such paramount importance, especially in these times, and so intimately connected with ethics, as that of Free-will; more particularly, in view of the fact, that the most strenuous efforts have been made by a certain class of writers to erase the idea and term out of our modern 'philosophy.' This could scarcely be done, if the discussion were relegated to the end of what is, to all intents and purposes, a Volume.

It was originally intended to publish the two Parts simultaneously; and, indeed, a great portion of the second Part is already written. Illness, however, has interfered with the accomplishment of this purpose; and it has seemed better to put before the public, at once, the Part which has been completed.

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CHAPTER IV.

THE EFFICIENT CAUSE.

ARTICLE I.

Definition and Divisions of the Efficient Cause.

We have now at length reached that which, for various reasons, may be justly considered as the most important of those three causes that physically contribute in one way or another towards the production of their common effect. It is true that the causes we have hitherto considered have acquired a special prominence, in face of certain physical theories which for the time seem to engross public attention; but such prominence is adventitious and will not last. For, while it would be idle to depreciate investigations that have occupied the thought of many from the rise of philosophy up to the present hour; it is nevertheless true that matter and form, as the joint constituents of bodily substance, restrict contemplation within comparatively narrow limits, and detain us in a sphere which is not the highest among the spheres of truth. By how much we near matter, by so much do we retreat from the intelligible; and by how much we near the intelligible, by so much we recede from matter, its conjuncts and conditions. Moreover, even on the mere point of number, material things are as nothing in comparison with the Spiritual Intelligences that fill up the interval between the visible universe and the Creator. But within this interval, material and formal causality, as physical constituents of substance, have no place. The same cannot be said of Efficient Causality. There is not a being actually existent or yet to be,—not even God Himself,—

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that is not either Efficient Cause or effect; and further, with the sole exception of God, there is no being that is not at once cause and effect. Thus it is, that Efficient Cause and effect dichotomize being. Further: It is Efficient Causality that links finite to finite being in all the wealth of order and of progressive development, and, collecting all finite being into one, exhibits it as a pendant from the Infinite. If unity is the perfection of science, as most certainly it is; Efficient Causality best shows the way. Without it each entity would be itself in itself, wholly disconnected from all other; while the finite and the Infinite would be confounded in a common independence. Even within the compass of material things, its influence is far stretching. It enters into the questions of locomotion, of growth and nutrition, of sensation, appetite, and—last not least—of the reproduction of living things. All finite beings postulate an Efficient Cause in order to be; and if a material and a formal cause are necessary to bodies in order to their first act of *being*, Efficient Causality is likewise necessary in order to their second act of *operation* or *doing*.

Proportionate to the importance of the Efficient Cause, is the difficulty of giving a clear and scientific account of it. Its presence above, around, within us is evident enough; but when we come to explain its nature and mode of causing, the subject is beset with many difficulties. So it is with all the things of creation. The facts are plain; but the causes of the facts (in the certain knowledge of which true science consists) are recondite. It is a matter of every-day experience that we sow and we reap; but push inquiry, with the observation of some six thousand years to help you, into the intimate causes of this phenomenon, there is an inevitable mystery at the root of it.

This being so, it is more than ever necessary that we should start with a precise definition. The next important point will be to determine the different kinds of Efficient Causes, their relation to each other, the relation of their mutual differences, and how far the definition is verified in each instance. The present Article, therefore, will be divided into two Sections; the first of which will be devoted to the definition, the second to the divisions, of the Efficient Cause.

§ 1.

The Definition.

It would be difficult to discover a more accurate definition of an Efficient Cause than the one given by the Philosopher in a passage of his *Metaphysics* and of his *Physics*, (for the two places are textually the same). This Aristotelian definition has been generally received in the School; though Suarez, as will be seen, has objected to it. It is as follows: The Efficient Cause is one '*whence is the first beginning of change or of rest*[1].' It is proposed to subject this definition to analysis; then, by way of a summary, to point out the force of each word of it; and, finally, to state and resolve the objections that Suarez has brought against it.

i. Since all human cognitions are primitively derived from the senses, it is a way with the Philosopher,—and a laudable way it is,—to extract the fundamental ideas of his philosophy from the facts of experience. Accordingly, in the present instance he defines the Efficient Cause in terms borrowed more or less from locomotion. There is an apparent exception which will be looked to later on. Let us, then, go to locomotion in order to gather, if possible, precise notions touching Efficient Causality. Suppose a stone to be thrown upward perpendicularly in the air. There are, it need hardly be said, other causes of change in the facts which meet the eye; but let us limit our observation to the two principal,—the upward impulsion given by the thrower, and the downward force of gravitation. The stone moves upward, till it has arrived at a point of momentary rest wherein the effect of the two opposing forces is equalized. It then descends with an increasing velocity towards the centre of gravitation. Thus there are two motions, and three points of rest that are really four, since one of the three does double duty. There is the impelling motion upwards, commencing from the hand and ending at the point of highest elevation; and there is the motion downwards, commencing from the same point of highest elevation, and terminated at the nearest practicable approach to the centre of gravity. In this instance, the propelling force of the thrower is the cause of the upward motion whose rest is at the highest point of elevation; the force of gravitation is the cause of the descending motion, whose point of rest is on the earth's

[1] ὅθεν ἡ ἀρχὴ τῆς μεταβολῆς ἡ πρώτη ἢ τῆς ἠρεμήσεως. *Met. L.* iv, (*aliter* v) *c.* 2; *Physic. L.* ii, *c.* 3.

surface. Let us assume one other instance. There is a certain number of balls, touching one another and arranged in a straight line, on a billiard-table. A player places his ball in the line of these object-balls, and plays at them full. The last ball of the series alone exhibits any perceptible effects of the motion imparted; and it is propelled from the penultimate ball with a velocity proportional to that given to the player's ball by the cue, and in the same straight line. The rest of the balls in the series remain apparently motionless. Yet each ball has received the motion of the one that immediately precedes it; and the penultimate ball communicates the same motion to the last, which expends (so to say) its motive force, and returns to rest. Now, it is not necessary to inquire into the physical causes of this arrested motion; since we are dealing with a simple illustration. Roughly speaking, it may be said that he who gave the original impulse,—especially if he is a good player,—has determined its point of rest. There would be no difficulty, however, in admitting other causal efficiency; for there is nothing to prevent the same Subject of motion from being impelled by one Efficient Cause and arrested by another. Such, then, are the physical facts that will serve as the basis of our analysis.

It has been remarked in an earlier portion of this Work, that all motion is limited by two points,—that from which the movement commences, and that at which the movement ceases. For the present let us limit our attention to the former. As may be seen from the illustrations given above, the first thing to look to in the present inquiry is motion as it manifests itself in inanimate bodies. The stone is at rest in the man's hand. It is there that motion is communicated to it. What is the reason why from a previous state of inertness it suddenly passes into a state of upward movement? It is plain enough that it has no innate power of moving itself. This is implied when it is said that motion has been communicated to it. But communicated by what? Since it cannot be by anything inside of the stone; it must be by something external to the stone. Moreover: This external something must have a power or faculty sufficient for the communication of such motion and in the given instance,—that is to say, supposing the phenomenon,—necessary to its production. Such, then, is the Efficient Cause. In the case of the stone, it will be the hand of the thrower exercising a certain muscular force; the upward

motion of the stone will be the effect. Turn we now to the other point at which the motion ceases. It scarcely admits of doubt, that the original impulsion given has much to do with the determination of the point at which the stone attains its highest. Our modern improvement in the manufacture of cannon is a practical illustration of the principle. Accordingly, though there are doubtless concauses that notably conspire towards determining the point of arrest,—the resistance of the medium, for instance; it may be permitted, for the sake of simplifying the illustration, to consider this point as determined by the strength of the primitive impulsion. Having attained this point, there the stone reposes. Its subsequent downward motion is another effect due to another cause. From the above analysis two conclusions may be drawn. The one is, that the effect is not in the agent, but in something else; and that the effect in this something else connotes, as effect, a necessary dependence on the agent, or Efficient Cause. For this reason it would be more accurate to say that the man *produces* motion *in* the stone, than to say that he *communicates* motion *to* the stone. The other is a corollary from the former, and it is this: The effect must be really distinct from the cause. Accordingly, the Angelic Doctor remarks: 'This term, *cause*, evidently imports a diversity of substance, and a dependence of some entity on another[1];' and, though his observation applies to all real causality, yet it more peculiarly applies, (as its author in fact applies it), to Efficient Causality.

Now let us briefly analyze in turn the second illustration. In the instance of the balls on the billiard-table, there is a succession of Efficient Causalities. The player with his cue imparts motion to the ball on which he plays. This ball produces motion in the nearest ball in the line, that in turn to its neighbour, and so on, till the ultimate effect intended is produced in the last ball. Thus each preceding ball becomes a kind of Efficient Cause to the next in succession, and the cue in like manner to the player's ball; yet the original impulsion from the player's arm virtually directs, and is virtually in, the subordinate successive action of each ball on its neighbour. The player, accordingly, is called the primary or principal cause; all the rest,—cue and balls,—are secondary or instrumental causes.

[1] 'Unde hoc nomen *causa* videtur importare diversitatem substantiae, et dependentiam alicujus ab altero.' I^a^ xxxiii, 1, 1^m^.

If we pass on to the locomotion of living things, careful consideration will conduct us to the same conclusions. In order to exhibit this the more clearly, let us set forth the one seeming difficulty in the shape of an objection. It may be urged, then, that in the instance of animal locomotion it is impossible that either the recipient of the effect or the effect itself can be distinct from the agent, or Efficient Cause; because the motion is spontaneous, and the animal is cause of the effect in itself, since the motion is intrinsic. The same animal that produces motion, receives it. Hence it is commonly said that an animal moves itself. The answer is obvious. It is, indeed, the same animal that produces and receives the motion; but it is not the same part of the animal that is cause and Subject of the effect. Its instinct—a faculty of its soul,—is the principiant of the motion; and the limbs are the Subject. It may, therefore, be safely inferred that the locomotion of animate bodies is an effect exhibiting the same properties, and postulating the same relation to an agent entitatively distinct from itself and its subject, as the locomotion of inanimate bodies.

All transformation, all change,—all generations, corruptions, alterations,—are motions of a certain kind. Consequently, they have their two terms,—the initial point whence the change begins, and the point of rest or completion,—as well as the intervening motion. The pupa becomes a butterfly. The pupa is the starting-point; the butterfly, the term of accomplishment; and there is the transforming movement between. Again: The seed is one term; the plant the other; and there is the movement of progressive evolution between. Once more: Cold water is one term; boiling water the other; and the motion of heat between. Thus, then, in all substantial and accidental changes there is a motion and a term of rest; and this motion is communicated from without by an agent in some way entitatively distinct from the motion as well as the Subject of the motion.

The same idea may be *analogically* transferred to the act of Creation. For nothingness may be considered as the one term, and being the other; while there is a *quasi* motion between the two.

In each and all of the instances given, there is a real term of *rest*; and it behoves us to realize the precise meaning of this word. All natural motion terminates in an intended perfection. Motion

is the road; the term its possession. The natural operation of the creature tends towards its ultimate perfection; this attained, motion ceases and there is complete rest in the attainment. When a living thing has reached its full maturity, the motion of development ceases; and natural operation is limited to the preservation of its typal perfection. In rational action activity is continued, till the contemplated end is reached; after that, there remains simple fruition. Similarly, when man has arrived at the fruition of the Infinite,—the consummate Truth and Goodness,—he is in the term of his unchanging perfection. 'Rest,' says the Philosopher, 'is privation of motion[1].' But this definition must not be misunderstood. Such privation of motion does not include privation of act; it only excludes from act the imperfection of ulterior tendency, giving to it thereby its perfectness. Accordingly, the same Philosopher observes elsewhere: 'We say that the intellect has science and wisdom, from its being at rest and stationary[2].' There remains the vital habit and the vital act too at will, but not the action of search (which is motion); since the soul rests in the acquisition of the knowable. The Angelic Doctor has a passage in which, with his wonted precision, he explains the nature of this rest. 'Every recipient,' he writes, 'is perfected, accordingly as it is informed by means of the form of its agent; and, in virtue of this, its motion is terminated, and it is at rest. Thus, the intellect, prior to its information by the form of the intelligible, inquires and doubts; but when informed by it, inquiry ceases, and the intellect is stably fixed in the intelligible. And then the intellect is said to adhere firmly to that entity. In like manner, when the desire or appetite is wholly imbued with the form of the good that is set before it, it experiences a self-complacency in it, and adheres to it as though fixed in it. And then it is said to love it[3].'

These illustrations, which St. Thomas has given, suggest another

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[1] *ἡ γὰρ ἠρέμησις στέρησις τῆς κινήσεως. Physic. L.* viii, *c.* 1, *v. m.*

[2] *τῷ γὰρ ἠρεμῆσαι καὶ στῆναι τὴν διάνοιαν ἐπίστασθαι καὶ φρονεῖν λέγομεν. Physic. L.* v, *c.* 3, *v. f.*

[3] 'Omne autem passivum perficitur secundum quod informatur per formam sui activi; et in hoc motus ejus terminatur et quiescit. Sicut intellectus, antequam formetur per formam intelligibilis, inquirit et dubitat, qua cum informatus fuerit, inquisitio cessat, et intellectus in illo figitur. Et tunc dicitur intellectus firmiter illi rei inhaerere. Similiter, quando affectus vel appetitus omnino imbuitur forma boni quod est sibi objectum, complacet sibi in illo, et adhaeret ei quasi fixum in ipso; et tunc dicitur amare ipsum.' 3 *d.* xxvii, *Q.* 1, *a.* 1, *c.*

observation of no little importance. In the instances with which the present Section commenced, the Efficient Causality is transient, —that is to say, it passes from one entity to another really distinct. Such is Efficient Causality in its strict signification. On the other hand, acts of intellect and will are the results of an immanent causality, wherein a real physical distinction between agent and Subject is impossible. But it will not be necessary to enter further into this question here, as it will be fully discussed later on.

ii. By the light of the above analysis let us now consider the definition of Aristotle.

a. The proximate genus is *Cause* (*αἴτιον*), which is given at the commencement of each of the two passages.

b. The rest of the words constitute the difference.

c. Whence (*ὅθεν*) excludes the two intrinsic causes of being. It likewise excludes the final cause which is not *whence* but *whither*,—the *for the sake of* (*οὗ ἕνεκα*).

d. The commencement (*ἡ ἀρχή*); that is to say, that which gives rise to, originates,—not a mere condition or disposition. It connotes real influx into the effect and the dependence of the latter upon its cause.

e. The *first* (*πρώτη*) commencement. 'First' may be understood in a variety of ways. (1) It may mean principal or primary, as will be more fully explained in the next Section. (2) It may mean proximate. (3) It may mean the First and Absolute Cause. (4) It may mean, that which is the agent of the first commencement of motion. It is in this last sense that the word must be understood in the definition. The three former meanings contract the Efficient Cause to one or other of its species.

f. Of change (*τῆς μεταβολῆς*). This word includes motion of whatever sort,—motion from place to place, motion of generation and corruption, motion from faculty to act, motion of accidental alteration, motion or change from nothingness to being.

g. Or (*ἤ*). This disjunctive particle suggests that there may be one Efficient Cause of the motion in a given case, and another Efficient Cause of the subsequent rest.

h. Of rest (*τῆς ἠρεμήσεως*). This word includes every term of motion,—local rest, constituted substance, accidental composite, the act of every faculty, actual being.

iii. Suarez objects against this definition,

1. That the genus is omitted. This is denied. The genus, as has been shown, is given.

2. That Creation is the principal effect of the First Cause, yet it is excluded from the definition; for Creation is not change, since change presupposes a Subject. Therefore, the definition is inadequate. Deferring the general question contained in this objection to the last Book, it is enough for the present to reply: First of all, there is no single attribute that is univocally predicable of God and of finite being; but the definition of Aristotle is analogously attributable to the Creator in relation to His Act of Creation. Then, in the second place, even if change is not analogously predicable of Creation, surely rest or accomplishment is.

Influenced by the supposed force of these objections, Suarez has proposed another definition of his own, to the following effect: *Efficient Cause is an absolute principiant from which there is primarily action.* But this definition seems to labour under several serious defects. First, it introduces a remote, in place of the proximate genus. Secondly, the word *absolute* would seem to limit Efficient Causation to God, and certainly to exclude instrumental causes. Thirdly, action is not the effect which formally designates the Efficient Cause. Fourthly, the definition is tautological; for action and efficiency are one and the same thing. In answer to the third charge Suarez replies that, though action is not the effect, it is the road to the effect which is, consequently, included sufficiently under, or indicated by, action; and that its introduction into the definition has the advantage of discriminating the Efficient from other causes. But the former plea does not justify the change; while the latter offers no sufficient reason, unless it can be shown that the new definition has an advantage over that of the Philosopher in this respect. Yet Suarez admits that Aristotle adopted the term, *change*, 'because it is better known, so that by means of it we can understand the dependence of whatsoever entity on the principiant from which it receives being.' To the fourth charge Suarez has not given anything like a satisfactory answer[1]. Wherefore, there is no apparent reason for abandoning the received definition.

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[1] Vide *Metaph. Disp.* xvii, § 1.

§ 2.

Divisions of the Efficient Cause.

I. The first division is into that which is a *cause absolutely* (per se) *efficient* and a *cause accidentally efficient*. The Angelic Doctor makes frequent reference to this division. The following passages have been selected for the purpose of elucidating the nature of these two species of Efficient Cause. 'A thing,' says St. Thomas, 'is cause of another in two ways; in one way absolutely, in another way by accident. That is absolutely cause of another, which produces the effect according to the virtue of its own nature or form. Whence it follows, that the effect is in itself intended by the cause. . . . A thing is cause of another by accident, if it be a cause removing a prohibitive,'—that is to say, an impediment; 'just as it is said in the eighth Book of the *Physics*, that he who pulls away a column, moves by accident the stone that is placed on the top of the column[1].' He gives elsewhere another instance 'in the opening of a window to let in the light[2].' Again: St. Thomas asserts that it is a cause by accident, if the agent 'causes a certain disposition towards a certain effect, as he who dries the faggots, is cause of their burning[3].' Yet again: 'There is a sort of cause by accident which effects a certain operation, but its operation does not reach to the connected effect; . . . as, for instance, it is plain that the persecution of a tyrant does not reach to the patience of the martyr, but to the tormenting of the body which is the material for patience. And such a cause is properly called an occasion[4].' Once more: 'There

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[1] 'Respondeo dicendum quod aliquid est causa alterius dupliciter: uno modo quidem per se, alio modo per accidens. Per se quidem est causa alterius quod secundum virtutem suae naturae vel formae producit effectum; unde sequitur quod effectus sit per se intentus a causa. . . . . Per accidens autem aliquid est causa alterius, si sit causa removens prohibens; sicut dicitur in 8 Physic., quod divellens columnam, per accidens movet lapidem columnae superpositum.' 1–2ae lxxxv, 5, c.

[2] 'Agens autem principaliter dicitur agere aliquid et per se et per accidens; per se quidem quod agit secundum propriam formam, per accidens autem quod agit removendo prohibens; sicut per se quidem illuminat domum sol, per accidens vero qui aperit fenestram, quae erat obstaculum lumini.' *Ma. Q.* ii, *a.* 11, *c.*

[3] 'Indirecte quidem, sicut cum aliquod agens causans aliquam dispositionem ad aliquem effectum, dicitur esse occasionaliter et indirecte causa illius effectus; sicut si dicatur quod ille, qui siccat ligna, est causa combustionis eorum.' 1ae cxiv, 3, *c.*

[4] 'Quaedam vero causa per accidens est quae aliquid operatur, non tamen pertingit

is a certain cause by accident, which does nothing towards the effect; as the musical art of a builder, for instance, in regard of a house. There is also a certain cause by accident, whose operation attains to the effect itself, which nevertheless it brings about unintentionally. Such a cause by accident is chance or fortune; as, for instance, a man digging a grave for a burial, unintentionally finds a treasure[1].' Finally: 'An entity is said to be cause of a thing by accident in two ways: In one way, on the part of the cause. Thus, the cause absolutely of a house is the builder, who happens to be a musician; and so to be a *musician*, which is an accident of the cause absolutely such, is said to be cause of the house by accident. In another way, on the part of the effect; as if it should be said, for instance, that the builder is cause of the house absolutely, but cause of something that befalls the house, (as, that it is fortunate or unfortunate), by accident[2].'

It now follows to dispose in order the teaching of the Angelic Doctor, as derived from the above passages. Wherefore,

That which is an Efficient Cause *per se* produces its effect by virtue of its own form or nature either substantial or accidental. Thus, for instance, the father is absolutely the cause of his son in virtue of his nature and substantial form. Hot water is absolutely cause of warmth to the hands in virtue of its accidental form of heat. With this definition the Efficient Cause *per se* may be dismissed for the present. Its divisions will be recorded later on.

That which is an Efficient Cause *by accident* is connected with, or related to the effect, not by virtue of its own form or nature, but in a variety of ways which divide it into so many species.

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ejus operatio usque ad effectum conjunctum; . . . . sicut patet quod persecutio tyranni non tangit patientiam martyris, sed cruciatum corporis qui est materia patientiae; et talis causa dicitur proprie occasio.' 1 *d.* xlvi, *a.* 2, 3^{m}.

[1] 'Est enim quaedam causa per accidens quae nihil operatur ad effectum, sicut musica aedificatoris ad domum. Est etiam quaedam causa per accidens, cujus operatio attingit usque ad effectum, quem tamen praeter intentionem inducit: et talis causa per accidens est casus vel fortuna; sicut fodiens sepulcrum ad sepeliendum, invenit thesaurum praeter intentionem.' *Ibidem.*

[2] 'Causa per accidens dicitur aliquid alicujus dupliciter. Uno modo ex parte causae, sicut causa domus per se est aedificator, cui accidit esse musicum; et sic musicum quod accidit causae per se, dicitur per accidens causa domus. Alio modo ex parte effectus, ut si dicatur, quod aedificator est causa domus per se, causa autem alicujus quod accidit domui, est per accidens; sicut quod domus sit fortunata vel infortunata.' *Ma. Q.* 1, *a.* 3, 14^{m}.

i. The first subdivision includes all those cases in which the accidental nature of the relation between cause and effect is referrible to the cause. This may occur variously. For,

a. In some instances the cause does not itself reach the effect, but (1) prepares the way for the effect. This it may do in a twofold manner. It may *positively* prepare the way, by disposing the Subject for the reception of the effect. Thus, he who dries the faggot, disposes the wood for receiving the form of fire. He who kneads the dough, prepares it for receiving the accidental form of bread. It may also *negatively* prepare the way, by removing some impediment which hinders the production of the effect. Thus, he who opens the shutters, removes an impediment that prevented the sun from shining into the apartment. (2) It may prepare a way for the effect by affording an opportunity. This occurs chiefly in moral causality. Thus, the persecutions of a tyrannical government give occasion to the patience of the martyrs.

b. Sometimes the putative cause contributes nothing towards the event. Thus, for instance, the Lord Mayor sells fruit, as happened some years back. It is not because he is Lord Mayor that he sells fruit; but because, being Lord Mayor, he is a fruiterer.

c. Sometimes the cause contributes towards, and reaches the effect, but unintentionally. This goes by the name of chance or fortune. Thus, a grave-digger, while digging a grave, lights upon a treasure. These *quasi* causes will be discussed in a later Article.

ii. The second subdivision,—or rather, the other member of the subdivision,—includes all those cases wherein the accidental nature of the relation between cause and effect is referrible to the effect. Thus, for instance, a medical man has cured the great tenor singer. The fact of the patient being a tenor singer, is quite irrespective of the cure. It is the man who is cured; and he happens to be a singer. So an architect builds a house that is inhabited by thieves; or he builds a church that is blown down.

Note I. 'Every cause by accident is reducible to a cause absolutely such[1].' This remark of the Angelic Doctor merits careful consideration. Every cause, then, whose relation to one effect is

[1] 'Omne autem quod est per accidens, reducitur ad id quod est per se.' *Ma. Q.* i, *a.* 3, *c.*, *v. m.* The translation is somewhat free, but justified by the context.

accidental, produces by virtue of its own form or nature some other effect intimately connected with the former; in such wise, that its absolute and direct causality relatively to the one effect is the foundation of its putative or indirect causality relatively to the other effect. Thus, for instance, when a man opens the shutters, he is really and absolutely the cause of the shutters being opened; and, on this account, the illumination of the room is attributed to him as to a partial cause. In like manner, he who is said to have cured the tenor singer, has really and directly restored the man to health; and he is said in consequence to have cured the singer, as having enabled him to resume his professional engagements. It is further evident that, in so far as an entity is Efficient Cause of such or such an effect only by accident, it is not strictly speaking a true cause. It must not be omitted, that there is a further reduction of these causes by accident, which will be explained in the sequel.

Note II. Such being the nature of a cause by accident, it does not merit to become *directly* an object of metaphysical consideration. It may, therefore, be dismissed. The subdivisions that follow are of the Efficient Cause absolutely and directly such.

II. The primary and fundamental division of Efficient Causes *per se* is into the First Cause and secondary causes. God is the First Cause; all finite beings whatsoever are secondary causes. The problem touching the Divine Causality belongs to the ninth Book. It may be, therefore, eliminated here.

III. An important division of Efficient Causes is into those that are *principal* and those that are *instrumental*. This division has been understood and used in a variety of senses; yet the senses all agree in attributing to the principal cause a certain pre-eminence, and to the instrumental cause a certain subordination, in the concurrence of each towards the production of the effect. The following are the more important meanings given to these terms: (i). By the principal cause is intended that cause which acts with absolute independence of any other Efficient Cause, even though it should please to serve itself of the latter; while all the rest, which have an essential dependence on this supreme cause, are termed instrumental causes. Thus the First Cause would be the Primary, all finite causes instrumental. This is not its ordinary signification

in the metaphysical science; though the terms are occasionally so employed by the Angelic Doctor. (ii). According to another usage, every power or faculty given to an entity in order to enable it to operate, even though such power or faculty is sufficient for the production of the effect, and is nobler than, or equally noble with the effect, is said to be an instrumental cause; while the supposit or substance, to which these faculties pertain, is deemed the principal cause. Thus, for instance, in accordance with this acceptation man or the human soul would be the principal, and the intellectual faculty the instrumental, cause of thought; albeit the intellect is sufficient for the production of thought, and is more perfect than thought, seeing that this latter is only an accident of the soul while the former is a property. Such is not the ordinary philosophical meaning of the two terms. (iii). The term *instrumental cause* has been likewise taken to represent any cause that is substituted in the place of another for the production of the effect, such as occurs in the case of a primitive impetus given to a ball. The principal cause will thus be that cause whose place is taken by the substitute. This meaning of the terms claims a prominent place in ethics. For instance, a man bent on his revenge hires an assassin to slay his adversary. The assassin is the instrumental cause; the man who hires the former, the principal cause. So in like manner, the prime minister is the instrument of the Queen. Such, again, is not the precise meaning that these terms bear in the metaphysical science. On the contrary, many of these causes which are morally instrumental would be ontologically principal causes. Wherefore, (iv). An instrumental cause, in the scientific use of the term, would seem to mean a cause that concurs towards the production of an effect nobler than itself and beyond the measure of its unaided energy. A principal cause, on the other hand, will be a cause which, by a virtue nobler than or at least equally noble with the effect, produces such effect in the Subject. Thus, heat concurs towards reproduction as an instrumental cause; the parents as principal cause. The chisel in the hand of a sculptor is an instrumental cause; while the sculptor is the principal. Such is the teaching of Suarez; and it is in harmony with that of the Angelic Doctor. 'An Efficient Cause,' writes St. Thomas, 'admits of a twofold division: One on the part of the effect,—viz. into the *disposing* cause which causes the ultimate disposition for the ultimate form, and the *accomplishing* cause which introduces the

ultimate perfection: The other, on the part of the cause itself,—viz. into the *principal* and the *instrumental* agent. For the principal agent is the first to cause motion; while the instrumental agent causes motion as having been itself moved. Now, a twofold action belongs to an instrument; one which it has of its own proper nature, the other which it has in so far as it has been moved by the principal agent; just as the heat of fire, which is an instrument of the vegetative faculty, (as it is said in the second Book *De Anima*), of its own nature has the power of dissolving and consuming and the like; but in so far as it is the instrument of the vegetative soul' in an animal, 'it generates flesh. Now, you should know that the action of the instrument sometimes extends to the ultimate perfection to which the principal agent introduces, but sometimes not; always, however, it extends to something beyond what is competent to itself according to its own nature, whether this something be the ultimate form or a disposition: Otherwise, it would not act as an instrument. Thus, the active and passive qualities of the simple bodies extend instrumentally to the eduction of material forms out of the matter[1].'

Thus, then, according to the Angelic Doctor there is no instrumental cause, which does not somehow extend to an effect beyond what is within its own competency in view of its own nature. Thus much will suffice for the present.

IV. The instrumental Efficient Cause is subdivided into that which is *conjoined with*, and that which is *separated from*, the principal cause. An instrumental cause may be either conjoined with

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[1] 'Causa efficiens dupliciter potest dividi. Uno modo ex parte effectus; scilicet in disponentem, quae causat dispositionem ad formam ultimam; et perficientem, quae inducit ultimam perfectionem. Alio modo ex parte ipsius causae in agens principale et instrumentale. Agens enim principale est primum movens; agens autem instrumentale est movens motum. Instrumento autem competit duplex actio: una quam habet ex propria natura, alia quam habet prout est motum a primo agente; sicut calor ignis, qui est instrumentum virtutis nutritivae, ut dicitur in 2 de Anima, ex natura propria habet dissolvere, et consumere, et hujusmodi effectus: sed inquantum est instrumentum animae vegetabilis, generat carnem. Sed sciendum, quod actio instrumenti quandoque pertingit ad ultimam perfectionem quam principale agens inducit, aliquando autem non; semper tamen pertingit ad aliquid ultra id quod competit sibi secundum suam naturam, sive illud sit ultima forma, sive dispositio; alias non ageret ut instrumentum. Sic qualitates activae et passivae elementorum pertingunt instrumentaliter ad formas materiales educendas de materia.' 4 *d.* i, *Q.* 1, *a.* 4, *q.* 1, *c. p. m.*

the principal cause or separated from it in entity, or in causality, or in both.

i. An instrumental cause is conjoined in entity with the principal cause, when it is united to the latter either by actual contact or by real union or by some sort of presence. Thus, the pen of a scribe is conjoined with the writer's hand by actual contact. The hand of the writer is conjoined with the writer, (who is principal cause,) by real physical union. The senses, as instruments of intellectual cognition, are conjoined with the intellect by immediate presence.

ii. An instrumental cause is separated entitatively from the principal cause, when in no one of the above senses it is conjoined with the principal cause. Thus, a seed sown in the ground is neither by actual contact nor by real union nor by presence united to the parent plant. The same may be said of an agent in foreign parts, and of a published work.

iii. An instrumental cause is said to be conjoined in causality, when it requires the *actual* influx of the principal cause. Thus, for instance, the telegraph wires can only convey the messages for so long as the person employed is working the instrument.

iv. An instrumental cause is said to be separate in causality, when it does not need such actual influx of the principal cause. Thus, heat is an instrument of fire in heating water; yet the form of heat in the water does not require the actual influx of fire in order to warm the hands.

Note. An instrumental cause may be conjoined with the principal cause both in entity and causality; as, for instance, the pen of a writer or the saw of a carpenter. It may likewise be separate from its principal cause both in entity and causality, as the seed in a seedman's shop.

V. Efficient Causes are further divided into *physical* and *moral*. A physical cause is one that really produces the effect by its own natural operation; a moral cause is one to which the effect is only imputed. Thus, for instance, the intellect is physical cause of thought. Wherefore as is plain, *physical* in this place must not be identified with *material*. An example of a moral cause is to be seen in the instance of one who gives counsel to another. St. Thomas extends this application of the term even to deliberation or self-counsel; 'for an agent who acts from deliberate intention,

acts by virtue of his own knowledge which, by deliberating, he gives to himself[1].' Aristotle has signalized this division in the illustrations appended to his division of causes quoted in the third Article of the first Chapter in the present Book (Vol. II, p. 178). His words are,—referring to the Efficient Cause,—'as, for instance, he who gives counsel is cause, and the father is cause of the child[2].'

VI. Physical Efficient Causes are either *necessary* or *free*. The former cause by a necessary determination of their nature, and are not unfrequently called *natural* causes; the latter have the power of causing or of not causing at their pleasure. This division is really dichotomic; for, as St. Thomas observes, 'Every agent acts either by nature or by intellect[3];' and every entity is in one way or another an agent. The term, *necessary*, must not be here understood as contradistinguished from *contingent*, but as the opposite of *voluntary*. It designates a cause which cannot help acting, when in due presence of its object and of the requisite conditions. Wherefore, as St. Thomas puts it, 'Will is divided from nature, as one cause from another; for some things are produced naturally, others voluntarily[4].' Thus, all the operations of nature—that is to say, of the unintelligent creature,—are necessary; while the operations of the intelligent creature, *as such*, are free. Free Efficient Causes are distinguished from the moral causes mentioned in the preceding division, forasmuch as the former do, while the latter do not, physically produce the effects attributed to them. It is plain, however, from the nature of the case, that all moral causes, properly so called, are free.

VII. There is yet another division of principal Efficient Causes into *univocal* and *equivocal*, which is often introduced in the philosophy of the school. A univocal cause is one that produces an effect similar to itself; as, for instance, fire begets fire, a horse a horse, and the like. An equivocal cause is one that produces an effect which is not similar to itself, and may be of various kinds.

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[1] 'Consilians autem in his quae agunt a proposito, est quod dat agenti formam per quam agit. Nam agens a proposito agit per suam scientiam, quam consilians sibi tradit.' *Phys. L.* ii, *lect.* 5, *v. m.*

[2] οἷον ὁ βουλεύσας αἴτιος καὶ ὁ πατὴρ τοῦ τέκνου. *Metaph. L.* iv (*al.* v) *c.* 2.

[3] 'Omne agens vel agit per naturam vel per intellectum.' *Cg. L.* iii, *c°.* 2, *p. m.*

[4] 'Voluntas dividitur contra naturam sicut una causa contra aliam: quaedam enim fiunt naturaliter, et quaedam fiunt voluntarie.' 1–2^{ae} x, 1, 1^{m}. *Cf.* 2 *d.* i, *Q.* 1, *a.* 5, 11^{m}.

Thus, heat, for instance, produces softness in wax, hardness in clay, brilliancy in iron. So far Suarez.

This division, however, merits further explanation and comment. Let us consider for a moment the terms; for such consideration will lead the way to a clearer and more definite idea of the distinction between these causes. The terms, then, *univocal*, *equivocal*, *analogous*, are borrowed from a logical division of nouns. A univocal noun has one meaning; an equivocal noun, a simple diversity of meanings; an analogous noun, a diversity of meanings absolutely, yet one meaning after a sort. Now, an effect may justly be considered as the meaning of its cause *as* cause. If, therefore, a cause is essentially limited to one effect which is the expression of itself by specific likeness; it is called a univocal cause. If a cause has more than one effect, or an effect which is not the determined expression of itself; it is called an equivocal cause. If a cause has more than one effect, no one of which is the expression of itself by specific likeness, yet each having according to some general form an inadequate likeness of some sort to the said cause; it is denominated an analogous cause. Having thus defined the meaning of the terms, it remains to draw certain conclusions.

i. A univocal cause cannot be the Efficient Cause of an entire species. The reason is, that its effect is specifically the same with itself. But the specific nature is determined by the form. Therefore, a univocal cause produces an entity with a form within the same species as its own form. If, then, it could be cause of the whole species; it could be its own cause.

ii. Since a univocal cause produces its effect in specific identity of form, and cannot be cause of the entire species; it follows that such cause can only be cause of the form, not of the entire entity. Hence, it produces but cannot create.

iii. It follows, that 'In causes which are essentially ordered to the entire species, the cause and that which is caused' (the effect) 'cannot be of the same order or of the same species; because the causality which they have is superior to the essence of the species as such[1].' Therefore, they must be either equivocal or analogous causes.

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[1] 'In causis enim quae essentialiter habent ordinem ad totam speciem, oportet quod causa et causatum non sint ejusdem ordinis nec ejusdem speciei; quia habent directe causalitatem suam supra essentiam speciei inquantum hujusmodi.' 2 *d.* xviii, *Q.* 2, *a.* 1, *c.*

iv. It is consequent upon what has gone before, that the effect depends upon a univocal cause in its production only; on an equivocal or analogous cause, it may be dependent in its whole being.[1]

v. It is another consequence, that an equivocal or analogous cause may be Efficient Cause of a whole species; a univocal, of the specific form in this or that individual entity.

vi. From the above it follows, that in the instance of univocal causes the effect is in its cause by specific identity of form; in that of equivocal or analogous causes, the effect is in the cause by virtual inclusion of its own under a nobler form[2].

vii. It is further concluded, that all univocal causes are reducible to an analogous cause.

viii. 'A univocal and a non-univocal cause are properly speaking and simply divisions of that kind of cause whose it is to bear a likeness to the effect. Now, this belongs to a principal, and not to an instrumental agent. . . . Wherefore, properly speaking, an instrument is neither a univocal nor an equivocal cause. It might, however, be reduced to the one or the other, forasmuch as the principal agent, by virtue of which the instrument acts, is a univocal or non-univocal cause[3].'

ix. God is pre-eminently *the* analogous Cause; since He is simply different from all His Effects, while these latter have a certain similarity to Him[4].

VIII. Finally, Efficient Causes are divided into *integral* and *partial*. An integral cause is one which of itself and solely by its own proper causality,—that is to say, apart from any other *finite* Efficient Cause,—produces its effect; while a partial cause is one which, in union with other finite Efficient Causes, produces a given effect. Thus, if a fisherman hauls his boat up upon the beach by himself, he is integral cause of the effect; if others give a hand to the painter, he would be only partial cause. Two observations are necessary:

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[1] *Cf.* 1ae civ, 1, *c.*

[2] Vide 1ae iv, 2, c.; *et praesertim* 3, *c.*

[3] 'Causa univoca vel non univoca, proprie loquendo et simpliciter, sunt divisiones illius causae cujus est similitudinem habere cum effectu. Haec autem est principalis agentis et non instrumentalis. . . . Et ideo, proprie loquendo, neque instrumentum est causa univoca neque aequivoca. Potest tamen reduci ad utrumlibet, secundum quod principale agens, in cujus virtute instrumentum agit, est causa univoca vel non univoca.' 4 *d.* i, *Q.* 1, *a.* 4, *q.* 1, 4m.

[4] In connection with this division of Efficient Causes, see 1 *d.* viii, *Q.* 1, *a.* 2, *c.*; *Cg. L.* iii, *c*o. 7; *Pot. Q.* vii, *a.* 7, 7m; *Verit. Q.* x, *a.* 13, 3m.

i. It is said, that an integral cause is one that produces its effect without the intervention of 'any other finite Efficient Cause.' The qualifying prefix, *finite*, has been added; because no created cause can act without the direct co-operation of the First Cause. Wherefore, if an integral cause were one which caused apart from any other Efficient Cause whatsoever, nothing could be an integral cause save God. But philosophical usage has not so restricted the term.

ii. A partial cause need not be an instrumental cause; because, though *de facto* a joint cause in the given case, in its own virtue it may be equal to the production of the effect. Thus, for instance, in a tandem two horses are employed to draw the vehicle; yet one horse would have sufficed for the purpose.

ARTICLE II.

The real efficiency of finite being.

It must not be imagined that Malebranche was the first to deny the Causal Efficiency of created things; for we find this error strenuously combated by the Angelic Doctor as well as by his illustrious master Blessed Albert the Great. It would seem, according to the statement of Suarez, that in medieval times the opinion in question assumed three distinct phases. Some philosophers refused to every finite being whatsoever, spiritual as well as material, the title of Efficient Cause. Others denied that material entities could be such, while admitting that spiritual substances could be. Lastly: Others maintained that material things could produce accidents, but not substances; while they assigned to spiritual beings the virtue of producing certain substances inferior to themselves. These three theories will be combated in the next three Propositions.

PROPOSITION CCXXXIX.

Finite beings, as true and proper Efficient Causes, produce effects connatural with, and proportioned to their nature.

Prolegomenon I.

While admitting to the full the necessity of the Divine Concurrence to each and every operation of the creature, (as will be

established in its place,) the present Thesis maintains that finite beings are really and physically Efficient Causes of certain effects, —in other words, that they really and truly act on one another, producing things that are new.

Prolegomenon II.

It is added in the Enunciation, that the effects are *connatural with, and proportioned to* the nature of the finite cause, in order to define the limits of the causality claimed for the creature. Every entity acts according to its form or nature; and, consequently, the effect—which is the action *as* in the Subject—must be proportioned to the nature of each. Hence the proverb: *Nihil potest supra seipsum*,—nothing can effect that which is above itself.

Prolegomenon III.

In the present Article the truth of the principle of causality is taken as a Lemma from the *hundred and nineteenth* Proposition, which the reader is advised to consult.

The Thesis is established by the following arguments.

I. It is supported by the all but universal authority of philosophers, pagan as well as Christian. Aristotle takes it for granted everywhere throughout his Works. Thus, for example,—to limit ourselves to a few instances bearing an exclusive relation to material things,—he speaks of 'the natural operations and actions of eye, nose, and of the whole face, and of finger and of hand and of the whole arm[1];' 'of the natural operation of wine and of water[2];' of 'the action of stars[3];' of 'the natural operations of the sperm-cell[4];' of 'the natural operation of plants[5];' and generally, of 'the operation of nature[6].' As has been mentioned at the commencement of the present Article, Blessed Albert the Great

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[1] ἔργα καὶ πράξεις ὀφθαλμοῦ, μυκτῆρος, καὶ τοῦ προσώπου παντος, δακτύλου καὶ χειρὸς καὶ παντὸς τοῦ βραχίονος. *De Partibus Animalium*, *L.* ii, *c.* 1, *v. m.* Cf. *De Generat. Animal. L.* ii, *c.* 1, *v. f.*

[2] τοῦ οἴνου ἔργον καὶ τοῦ ὕδατος. *De Gen. et Corr. L.* i, *c.* 5, *p. m.*

[3] διὸ δεῖ νομίζειν καὶ τὴν τῶν ἄστρων πρᾶξιν. *De Coelo*, *L.* ii, *c.* 12, *p. m.*

[4] οὕτω γὰρ καὶ περὶ τῶν ἔργων αὐτοῦ (sc. σπέρματος). *De Gen. Animal. L.* i, *c.* 18, *in m.*

[5] τῆς μὲν γὰρ τῶν φυτῶν οὐσίας οὐθέν ἐστιν ἄλλο ἔργον κὶ ἡ πρᾶξις. *Ibid. L.* i, *c.* 23, *p. m.*

[6] τῆς φύσεως ἔργον. *De Part. Animal. L.* ii, *c.* 15, *fi.*

and St. Thomas have stoutly maintained the truth of this Thesis; and the latter has stigmatized the opposite opinion as *erroneous* and *folly*. Some of his arguments will be borrowed presently.

II. It is likewise supported by the common sense and general judgment of mankind. A man puts his hands unwittingly into very hot water, and gets scalded; whereupon he adds cold water, and moderates the heat. He never thinks of doubting that it was the heat of the water which scalded him; or that it was the action of the cold water, which enabled him afterwards to wash his hands in peace. Storms have constantly arisen at sea from the beginning, and men have been drowned: Mankind has always fed on the fruits of the earth. The general voice has attributed the death of the former to suffocation by the waters; and the continued life and growth of the latter to the real nutritive qualities in the wheat, etc. It would instinctively reject the strange hypothesis, that the billows of the deep do nothing, and that the food itself gives no strength; but that the good Creator takes occasion of the presence of the storm to cause death in the one case, and immediately Himself feeds the bodies of men on occasion of the presence before them of the bread, etc., in the other case. But the general judgment of men in all ages is an infallible witness of truth.

III. An additional argument is to be found in the inconveniences which would result from the contrary opinion. For, if it were true that finite beings are not Efficient Causes;

i. A stop would be put at once to the power of discriminating the various natures of things. It would be impossible to distinguish between animate and inanimate beings; since God, *for all that we can tell*, might produce the phenomena of life on occasion of the presence of a stone, and the phenomena of an inert body on occasion of the presence of a living animal. According to the hypothesis of occasionalism,—which is the opinion directly refuted here, though the same arguments with but slight modification would equally apply to other phases of the same error,—neither the one nor the other could reveal itself to us; since neither could have any action upon us. To us it would be precisely as though it were not; for we only know of the things of nature by their action on our senses. Its very existence would be unknown to us; unless we should be certified of the fact by an immediate Revelation from

God. Our sensations would be Divine effects, leading to no knowledge either of the Creator or of the creature.

ii. Supposing that each entity has its own properties and discriminative qualities, (as experience and reason alike lead us to conclude); these properties would be superfluous and useless. They would remain otiose, incompetent to disclose to us any signs of being.

iii. Yet further: 'If effects are not produced by the action of creatures, but by the action of God alone; it is impossible that the virtue of any created cause could be made manifest by its effects. For an effect does not show the virtue of a cause save by reason of action which, proceeding from the faculty, is terminated to the effect. But the nature of a cause is not known by an effect, save in so far as its faculty, which accompanies the nature, is known by the same. If, therefore, creatures are without actions for the producing of effects, it follows that in no case could the nature of any created thing be known by the effect; and thus all cognition of natural science, in which especially demonstrations proceed from the effect, is withdrawn from us[1].'

iv. Hence, again, dispositions of soil, climate, rain, heat, differences of seeds, ploughing, pruning, grafting, sowing, and the like, would be entirely superfluous; for the presence of wheat—whatever such presence may mean, which is a further difficulty—would suffice that, on occasion of it, God should produce wheat. The presence of an apple-pip would suffice for the Divine production of apples, the presence of a cow for the Divine production of a calf, and so on.

v. In living bodies we perceive a complex organism, which becomes more perfect with the increase of perfection in the grades of being. Some organs, such as the senses, are adapted for receiving impressions in the Subject; others, as for instance, the voice, reproductive organs, etc., serve for acting upon others. A

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[1] 'Si effectus non producuntur ex actione rerum creatarum, sed solum ex actione Dei, impossibile est quod per effectus manifestetur virtus alicujus causae creatae; non enim effectus ostendit virtutem causae, nisi ratione actionis, quae, a virtute procedens, ad effectum terminatur. Natura autem causae non cognoscitur per effectum, nisi inquantum per ipsum cognoscitur ejus virtus, quae naturam consequitur. Si igitur res creatae non habeant actiones ad producendum effectus, sequitur quod nunquam natura alicujus rei creatae poterit cognosci per effectum; et sic subtrahitur nobis omnis cognitio scientiae naturalis, in qua praecipue demonstrationes per effectum sequuntur.' *Cg. L.* iii, *cc.* 69, 70.

similar division of qualities is discernible even in unorganized bodies. But these active and passive qualities or organisms would be simply useless, if finite being exercised no Efficient Causality; for these would be incapable of either giving or receiving, since all interaction is excluded by the hypothesis.

IV. If God alone operates through all things; there would be no sufficient reason to account for that complex variety of effects which are revealed to us by the experience of our senses. The *Antecedent* is thus proved. The Divine Operation is not varied, because It operates in the midst of many things. There is no assignable reason why He should always operate cold in connection with ice, and heat in connection with fire; or why He should always create a horse on occasion of a horse's presence. It may be urged, indeed, that He could create these sensile impressions and simultaneously the living things connected with them; nor can the *absolute* possibility of such parallel operation without and within us be denied to His Omnipotence. But there are two insuperable difficulties in the way of such an explanation. The first is, that this supposed multiplication of Creative Acts is unnecessary and, therefore, repugnant to a true philosophy. The second is, that such an opinion would offer no sufficient,—indeed, no conceivable,—reason why the said Divine Creations should be indissolubly linked to certain creatures, so as that the mere presence of these latter should determine the action and nature of the former.

V. The above argument is confirmed as follows. It is contrary to Wisdom, that in the Works of Wisdom there should be anything superfluous and vain. But, in the hypothesis that God is the sole Efficient Cause, the introduction of so many finite beings as a condition of the production of certain effects in us would be superfluous and vain. Therefore, etc. If, for instance, God immediately produces in my body the sense of warmth, as I sit before the Christmas fire; of what possible service can the presence of the fire be?

VI. He who bestows upon another a gift, by the fact that he gives that which is principal in it, gives likewise that which is naturally consequent upon the former. Thus, if one makes the present of a dressing-case; he thereby gives everything contained in it. But God has produced creatures after the likeness of Himself by giving to them the first act of being; therefore, it is prone to conclude that He likewise bestows the second act of natural

operation, consequent upon the former, by which the likeness is completed.

VII. The perfection of the effect determines the perfection of the cause; more particularly when the cause is only known by its effects. Therefore, to detract from the perfection of the effect, is to detract from the Creative Virtue of the Creator. But to deny to the creature its own natural operation, is to detract from its perfection; since it is of the full perfection of an entity, to be able to communicate to another of its own perfectness. Therefore, etc.

VIII. The eighth argument is confirmatory of the preceding. The imperfect is for the sake of that which is more perfect. As, then, matter is for the sake of the form; so the form, which is the first act, is for the sake of natural operation, which is the second act. This operation is the end, or proximate final cause, of the creature. If, therefore, finite being were deprived of all efficiency; it would be debarred by nature from attaining its natural end.

IX. To subtract created things from the universal order, is to deprive them of that which is their greatest good: since the part is for the sake of the whole, and the whole is the final cause of the part. But to deny to finite beings their natural operation, is to subtract them from the universal order; for there is no other possible intercommunion, or bond of union, between entities that differ in their respective natures, than that which arises from their acting on, and in turn being acted upon by, one another [1].

Difficulties.

I. By how much causal efficiency is attributed to the creature, by so much is subtraction made from the Omnipotence of the Creator. Therefore, etc. The *Antecedent* is thus proved. Either God is Efficient Cause of all things or He is not. If He is not, He is not Omnipotent; because there is something to which His Power does not reach. If He is, either He is sufficient in Himself for all or He requires help. The latter supposition is intolerable even in thought. But if the former is true; then all co-operation of the creature is superfluous and, in consequence, inadmissible.

Answer. The *Antecedent* is denied. For the proof: The disjunctive *Major* is granted. The first Member of the *Minor*,—viz.

[1] Of the above arguments numbers IV, V, VI, VII, IX, are taken substantially from *Cg. L.* iii, c^{o}. 69; and number VIII from 1^{ae} cv, 5, *c.*

that *if God is not Efficient Cause of all things, He is not Omnipotent*,—may be allowed to pass, since the necessary distinction will be made more conveniently in the second Member. Wherefore, that *if God is the Efficient Cause of all things, either He is sufficient in Himself for all or He needs help*,—must be distinguished: In such case, *either He is sufficient in Himself for all, or He needs help*, or, though all-sufficient in Himself, He arranges so as of His own Will to receive the co-operation of His creatures for the clearer manifestation of His Wisdom, Power, and Love,—granted; simply as the disjunction stands in the objection,—denied, as being incomplete. *The latter is intolerable even in thought*,—granted; *if the former, then all co-operation of the creature is superfluous*,—distinguished: Antecedently to the Divine Will establishing the actual order,—let it pass; consequently upon such Decree of the Divine Will,—denied.

The above answer is in form; but it may not be amiss to subjoin an explanation, which shall be inaugurated with a quotation from the Angelic Doctor. 'It is not from any indigence in God,' writes St. Thomas, 'that He wants other causes for the act of production; but it is of His Goodness, Who willed to confer on others, among other things, the dignity of causality[1].' If, indeed, God should need the co-operation of secondary causes, because He is unable to produce the required effect without their aid; He could not be God, forasmuch as He would not be Omnipotent. But this is out of the question; since He Who creates the joint cause is Lord and Master over all its effects. Hence it is undeniable that He, the All-powerful, is capable of creating or producing all those effects, which He has chosen to produce in conjunction with the natural operation of His creatures. Yet not on this account is the Efficient Causality of the creature superfluous and vain; since it serves very conspicuously to manifest the Wisdom, the Power, and the Love of the Creator. It serves to manifest His Wisdom; for there is greater elaboration of design. To plan out a universe of finite entities, differing in essence and in grades of perfection, is doubtless a work of superhuman Wisdom; but to include in the design the further idea of conferring on these entities a complex variety of forces, qualities active and passive, faculties by virtue of which

[1] 'Non est ex indigentia Dei quod causis aliis indiget ad creandum; sed ex bonitate ipsius, qui etiam dignitatem causandi aliis conferre voluit.' 2 *d.* i, *Q.* 1, *a.* 4, 1^m.

nature should ever grow out of itself and develope from lower to higher forms of existence and should multiply along definite lines of being,—to conceive a world whose constituents should ceaselessly energize on one another, yet without confusion and in an admirable order,—to allow to the creature its own proper causality, yet, even spite of the manifold action of free-will in a countless multiplicity of immortal intelligences, to elaborate a perfect unity,—surely, this is an incalculably higher manifestation of Wisdom. It serves to manifest the Power of the Creator; for every cause is proportioned to the effect. But the completion of a design, such as has been just described, is a more noble effect than if every production of natural operation were the result of immediate creation. The manufacture of a watch is a notable work of art: But if a watch should be made, capable of constructing other watches in succession and of winding up, regulating, cleaning, repairing its offspring; there is no one who would not be free to admit that the inventor would possess a virtue of operation incomparably superior to his fellow men. It serves to manifest the Love and Goodness of the Creator; since the Divine Communication is more complete. Love shows itself in the desire of communicating its own perfection to the object of love: It is essentially self-diffusive. By bestowing on the creature existence which is a likeness to His own Existence, the Creator communicates of His own, so to say, to the object of His Charity; but by bestowing likewise an intrinsic activity proportioned in each case to the exigencies of the particular nature, He completes the similitude. By this consummation of the creature He causes it to partake, in its own proper measure, of the diffusiveness of His Goodness. There is nothing of solitariness in nature. By the very constitution of things, being is impelled to impart to being of its own perfection. Not only does the substantial form bestow upon the matter a specific determination, and the matter sustain the form in being,—not only does accident give its complement of perfection to substance, and substance give and preserve the being of accident,—not only does part conspire with part towards the completeness of the whole, and the whole delight in the welfare of each part; but substance generates substance, accident in its way accident, and the whole visible universe is knit together in the solidarity of a common need and of mutual support. Passing upwards, the orders of spiritual being, (both those that are included

in the visible creation and those which are pure Intelligences), bear in the activity of their will, which acts upon all that is around it, a yet nearer resemblance to the Charity of the Creator. Assuredly, then, the causal activity of finite being is not superfluous; even though God can, by His sole Omnipotence, do all that is effected by His creature.

II. There is a manifest contradiction in attributing to finite being any Efficient Causality. The *Antecedent* is thus proved. Forasmuch as a finite being is contingent, it depends upon the First Cause; consequently, if it were an Efficient Cause, its causality would likewise depend upon the First Cause. This is admitted by those even who defend the teaching of the present Proposition. On the other hand, if finite being acts; it acts by its own virtue exclusively, independently of any other. Wherefore, it would postulate an infinite power; which necessarily excludes dependence of any kind.

Answer. The assumption is denied, that all Efficient Causality essentially connotes an infinite virtue on the part of the cause. For as there is no repugnance in receiving an existence that is dependent on another; so there is nothing repugnant in the idea of receiving an efficiency or activity that is dependent on another.

III. There is a manifest contradiction in attributing to finite being action which is dependent on the Infinite Cause. These are the reasons: (i). The action would be at one and the same time infinite and finite, independent and dependent. (ii). The same action in its totality would proceed at one and the same time from two integral causes. But each of these hypotheses involves an apparent contradiction.

Answer. The *Antecedent* is, of course, denied. As to the first inference, there is need of a distinction: *The action would at the same time be infinite and finite* etc. terminatively—denied; entitatively,—a subdistinction is necessary: The two activities of the joint causes would be respectively, the one Infinite and the other finite, the one Independent and the other dependent,—granted; one and the same causality would be entitatively finite at once and infinite, dependent and independent—denied. As touching the second inference: The *Antecedent* is granted and the *Consequent* denied. There is nothing whatsoever repugnant in there being

two integral joint causes of one and the same integral effect, provided that the causes are in different orders with a subordination of the one to the other. Such is the answer in form; but perhaps it would not be the worse for a little explanation. Accordingly:

1. In the joint Action of the First Cause with secondary causes it is to be observed that the effect, which is the term of causal action and really one with it, is necessarily finite; because, owing to the mere fact of its producibility as of its actual production, it is contingent, and the contingent cannot but be finite. For the same reason it is dependent; seeing that, as produced, it necessarily depends on the cause or causes that produce it. Wherefore, the term of the Divine Causality is patently *finite* and dependent; in other words, the Divine Causality is *terminatively* finite and dependent. This, however, in no wise hinders the Divine Causality from being Infinite and Independent *entitatively*, —that is to say, in Its own Nature. If, then, the joint causal action is considered exclusively in its term, the action is neither infinite nor independent but finite and dependent; because the effect (with which it is identified) is finite. But, if the joint causal action is considered *entitatively* as it is in the cause, it is no longer one but two; because the principiants are two. Thus considered, therefore, there is nothing repugnant in there being one Causality of Infinite, another of finite virtue.

2. In the second inference the question is mooted, whether it is possible for two integral causes to unite in producing at the same time the same identical effect,—that is to say, whether two physical causes, capable by their own virtue each of producing the integral effect ascribed to both, can be joint causes of such effect. Now, if these two physical causes are in the same order of being, possessed (as a consequence) of equal efficacy and each independent of the other, the answer must be in the negative; because a multiplication of causes in the given case would be needless, and nature, while abounding in all that is necessary, rigorously excludes the superfluous. In the instance already given of the tandem, which is not an arrangement of nature but of human will, the two horses do not each of them produce the integral effect, though each might be capable of it; but the one produces its own partial effect distinct from that of the other. Wherefore, each does not produce the integral effect integrally.

But, if the supposed causes belong to different orders of being,—if the one is of superior efficacy to the other,—if the inferior is dependent on the superior cause,—in such case, there is no reason why the answer should not be in the affirmative. There is no conceivable repugnance in the joint action of such causes, producing integrally the same integral effect; otherwise, how would it be possible to retain instrumental, in the category of real Efficient Causes? An artist paints with his hand and brush. The material collocation of the colours on the canvas is wholly an effect of the painter's hand, wholly an effect of the pencil, wholly an effect of the artist. It may be objected that God could produce the effect without the creature, whereas the artist could not execute the painting without his hand. This last assertion is not true to the letter; because in our own times we have heard of an artist at Brussels, who painted with his foot. Nevertheless, it cannot be denied that there is a difference; for without some member of his body, as also without his brush and colours or something equivalent to these, the limner could not realize his conception. Take, then, another instance that is nearer the mark: One man hires another to assassinate an enemy. He is (we will suppose) equally with the assassin competent to do the crime. Both are integral causes, but in different orders. It is true that the causality is physical in the one cause, in the other only moral; still, the instance serves to illustrate the principle, and it is impossible from the nature of the case to find an example parallel in all respects with the one in question. For it must be borne in mind that, in the interaction of purely finite causes, you will look in vain for that 'absolute dependence by which secondary causes are subjected to the First Cause.' Nevertheless, the dependence of an instrumental on the principal cause is so closely illustrative of the dependence of finite causes on the infinite Cause, that the Angelic Doctor repeatedly speaks of creatures as instruments, in their operations, of the Creator.

Note. There are difficulties of another kind relating to the Divine Co-operation with the Efficient Causality of the creature, which will find a more appropriate place in the last Book.

IV. The fourth and last objection is particularly directed against the third argument, which has been advanced in proof of the Proposition. All the inconveniences there alleged to flow from the opinion that God is the sole Efficient Cause, only tell against such

opinion in the hypothesis that the Action of God is purely arbitrary. If this, indeed, were the case; then it would be impossible to cognize the natures and properties of things from natural or apparently natural phenomena, and special organisms would be superfluous, as has been urged in the aforesaid argument. But let it once be admitted that God has determined with Himself to regulate His Action in harmony with the nature of those creatures, on the occasion of whose presence He operates; the objection ceases to have force. Thus, for instance, in the presence of fire God has bound Himself (we will say) to produce heat, in presence of turnip-seed to produce a turnip, in presence of a sheep a lamb, and so on. Thus much supposed, it is plain that we should be competent to conclude concerning the nature of each entity from the Divine production, and that such or such organism would be a necessary condition of the Divine operation. Thus, on occasion of certain given organs, He would produce the nutritive and crescent activity of vegetable life, and on occasion of certain other organs would produce the sensile activities of animal life. Therefore, these qualities and organisms would not be superfluous; nor would there be those inconsequences which are laid to the charge of occasionalism.

Answer. The explanation offered does not at all enervate the force of the third argument. For, in the first place, according to this hypothesis the said qualities and organs do nothing. They have, consequently, no reason for their being. They are utterly useless; because God alone operates in their stead. Then, again: It is not easy to understand, on such a hypothesis, why, if heat is the occasion of heat, whiteness should not likewise be an occasion for producing whiteness, and quantity for producing quantity. Thirdly: Such a theory does not account for the existence of equivocal causes,—that is to say, why, for example, on occasion of the presence of one and the same entity God should melt wax, harden clay, make hot short-iron brittle, and cold short-iron ductile. Lastly and principally: If such were the Divine arrangement, it would seem to be only congruous with the Divine Wisdom and Goodness, that such an arrangement should have been in some way or other revealed to man. Yet it is so far from being revealed by nature to man that, on the contrary, the instinctive judgment of mankind in all ages,—based on the evidence of natural phenomena as they exhibit themselves to sensile perception,—has

certainly pronounced that all creatures have their respective natural operations, and act upon one another by innate energies proper to themselves. On the other hand, it has never been pretended that such an arrangement of Providence has ever been supernaturally revealed. Wherefore, the theory in question would reduce us to the necessity of believing, that the race of man had been made the victim of invincible delusion and of practised deceit in the very foundations of human cognition. But such a conclusion is intolerable. Leibnitz, though more particularly referring to occasionalism in connection with the interaction of soul and body in man, nevertheless confirms the above answer in words that are worth quoting. 'Je n'ai pas cru,' he writes, 'qu'on pût écouter ici des Philosophes, très habiles d'ailleurs, qui font venir un Dieu comme dans une machine de théatre, pour faire le dénouement de la pièce, en soutenant que Dieu s'emploie tout exprès pour remuer les corps comme l'âme le veut, et pour donner des perceptions à l'âme comme le corps le demande; d'autant que ce *système*, qu'on appelle des *causes occasionelles* (parcequ'il enseigne que Dieu agit sur le corps à l'occasion de l'âme et *vice versa*) outre qu'il introduit des miracles perpétuels pour faire le commerce de ces deux substances, ne sauve pas le dérangement des lois naturelles, établies dans chacune de ces mêmes substances, que leur influence mutuelle causeroit dans l'opinion commune[1].'

PROPOSITION CCXL.

Not immaterial alone, but material substances also, are capable of real causal efficiency.

This Proposition is proved by the same arguments as the preceding. Indeed, having regard to that Efficient Causality which is by means of *transient* action and has a paramount right to the appellation, the efficiency of bodies is more known to experience, more evident to sense, than that of immaterial beings. It is, therefore, unnecessary to add any further declaration.

Difficulty.

No material substance can exercise any Efficient Causality on another. The *Antecedent* is thus proved. An Efficient Cause must be intimately present with the Subject of its causality. But bodies

[1] *Théodicée, Essais sur la Bonte de Dieu, etc., n.* 61.

cannot be so present to each other, because their quantity prevents the requisite intimacy of presence. On the other hand, quantity has no activity of its own; it, therefore, simply stands in the way of any efficiency from without. Lastly: Bodily substance is lowest in the scale of substances. Hence it can find no substance inferior to itself, on which it may be able to exercise its causality.

Answer. The *Antecedent* is denied. As touching the first proof alleged: It is not necessary to Efficient Causation, that the agent should be in its Subject by interpenetration; so that both should occupy the same space. All that is requisite is, that the former should be contiguous with the latter. The necessity and nature of this contiguity will be discussed later on. It is true, indeed, that quantity has no activity of its own; but it does not on this account hinder efficiency from without. Just as matter is not active, yet does not offer any impediment to the action of the substantial form, but rather helps it on by sustaining the form in being; so the quantity of a body contributes to the action of the qualitative forms by supporting them in being. That which is here said of activity equally applies, as is plain, to receptivity of action. As to the second proof: Bodily substances are not in the lowest grade of being, unless you take them in a lump and in regard of the *materia prima*, out of which they have been evolved in common. But within this vast genus there are countless species;—some higher, some lower. Even, then, if the principle assumed in the proof,—viz. that no agent could exercise Efficient Causality on a nature equal or inferior to its own,—were admitted; there is nothing whatever to hinder a material substance of a higher order from acting in a material substance of a lower order. Nature does not act by *genera*, but by individuals energizing according to the natural operation of their specific form. But the assumed principle must be summarily rejected, if applied to the entire latitude of Efficient Causality. It is most true that an inferior substance cannot generate a substance of a higher order than its own. *Nemo potest supra seipsum.* But it can exercise a causal efficiency on that which is superior to it in those respects in which it is equal, if not superior,—in the accidents of being. Thus, inanimate things may act upon human sensile perception; and the light and heat of the sun may have a wonderful causal efficiency in vegetable and animal growth. Evidently, with its equals it is capable of substantial reproduction.

PROPOSITION CCXLI.

Although secondary or finite causes cannot produce an integral substance in its entirety; nevertheless, they can generate material substance by educing the substantial form out of the pre-existing matter. Such Efficient Causality is found to exist in bodies, but cannot be attributed to separate Intelligences, or complete spiritual Substances.

I. The first Member of this Thesis, in which it is asserted that *secondary causes cannot produce an integral substance in its entirety*, is thus proved. To produce integral substance in its entirety, is to produce every one of its essential constituents; so that there is nothing in the substance, which is not formal term of the causality. But such an act would be an act of creation; since it would be the production of something out of nothing. Now, no finite cause is competent to create. Therefore, no finite cause can produce an integral substance in its entirety.

It will be well to apply the above conclusion to the two species of substance, in order to be able the better to understand the bearings of this Member of the Proposition. All substances are either material or immaterial. Immaterial substances are pure subsisting forms, wholly separate in their nature from matter. Consequently, they are simple substances, incapable of whatsoever real physical division. If, therefore, they are produced at all, they must be created; since, by reason of the simplicity of their being, either all that they are must be produced at once or nothing. Hence, the impossibility of generation properly so called in the instance of spiritual substances. Material substances, on the other hand, are physically composed of matter and form, which are physically separable. Now, if both matter and form were produced together by the same efficient action of the same secondary cause, the material substance in such case would be made out of nothing,—that is to say, it would be created. On this account it is, that primordial matter, as being the first Subject of all material substances, must be the term in some way or other of a creative act. Accordingly, all generation is simply resolved into a substantial transformation; for it is the production of a new substance out of the pre-existing matter.

II. The second Member, wherein it is affirmed that *secondary, or finite, causes can generate material substances by educing the substantial form out of the potentiality of the pre-existing matter*, is thus declared. On the one hand, there is no repugnance; since such an act of Efficient Causality is a simple production, not a creation. Supposing,—what has been already demonstrated in a previous Chapter,—that matter is in real subjective potentiality to each and all of these several acts or forms; it is only necessary that it should be proximately disposed for the evolution of such a particular form, and the generation of the new substance follows as a natural result. But such proximate disposition of the matter is not above the capacity of a finite cause; consequently, God can endow His creature with so much of Efficient Causality, if He pleases. It is true that this argument only concludes as to the possibility of such efficiency in finite being. But, on the other hand, it can be proved that this causality is universally and perpetually exercised in and by the things of nature. This leads us to the third part of the Proposition.

III. The third Member, which declares that *such Efficient Causality is found to exist in bodies*, is proved from daily experience. For we find that fire, for instance, not only produces heat (which is an accidental form); but likewise that it generates fire. In like manner, plants by their seeds and in other ways generate plants of the same species as their own; and in the animal world reptile generates reptile, fish fish, birds birds, beasts beasts, each according to its kind. The same law of reproduction holds good even in the case of man; though with one notable difference in the causality, which reason and not sensile perception reveals. Chemical experiments, again, are never-failing proofs that man has the power of generating inanimate compound, as well as simple, substances out of the potentiality of matter. But the facts are too general to justify any further detail.

IV. The fourth Member, wherein it is asserted that *the generation of material substances cannot be attributed to separate Intelligences, or complete spiritual Substances*, is thus proved. Those entities which are of an order in all respects different from that of material substances, between which and these latter there exists no sort of proportion, and which, consequently, do not contain in any sort either formally, virtually, or eminently, material substances in themselves, are incompetent to generate such substances. But

finite Intelligences are of this nature. Therefore, etc. The *Major* is plain; for under the given circumstances there is no sufficient reason for the existence of an Efficient Causality. *Like begets like.* Hence it behoves that there should be some at least initial likeness, virtual or eminent if not actual, between the Efficient Cause and its effect: In other words, since the Efficient Causality in question is finite, it behoves that the cause should be either equal to the effect by specific similarity or superior to it by virtual and eminent inclusion. (It is sufficiently plain that the present discussion deals with the principal, not with an instrumental cause.) Neither is it of avail to urge, that Angels are of a vastly superior order to that of material substances and that, as a consequence, they have a potency abundantly sufficient for the production of the latter; because in finite causality superiority of nature is not enough, unless, in addition, the cause somehow or other precontains the effect. The *Minor* is equally plain. A subsistent form, essentially remote from matter, evidently belongs to an order altogether different from that of bodies. It is likewise evident that there is no physical proportion between a pure spirit and bodies; but rather a notable disproportion. Neither is it hard to see, that an entity which essentially excludes matter from its substantial constitution, cannot precontain either virtually or eminently that which is essentially material; unless it is entitatively comprehensive of all being,—in other words, infinite. The above argument is confirmed by the truth, (which will be demonstrated in the sequel), that spiritual Intelligences cannot directly and formally produce even material alterations,—qualitative changes,—in bodies; *à fortiori*, therefore, they cannot produce substantial changes.

ARTICLE III.

The formal principiant of efficiency in finite causes.

Following the order pursued in the discussions on the material and the formal causes, we next proceed to determine what is the *formal* principiant of Efficient Causality. For in all Efficient Causes there is a twofold principiant, one of which may be called the material, while the other has been with reason denominated the formal principiant. The former is the supposit or person that operates; the latter, the power or faculty by which the former

operates. Hence, the one is appropriately called by the Doctors of the School the *principium quod,* the other the *principium quo,*—that is to say, the *principiant that* causes and the *principiant by which* the former causes. There is manifestly a marked difference between the two. Thus, for instance, Brutus thinks; but it is by his intellectual faculty that he thinks. The same Brutus looks at a picture; but it is by his sense of sight that he sees. So, fire generates heat; but it is by its own quality of heat that it communicates heat to another substance. In like manner plant generates plant; but the formal principiant is the faculty of reproduction existing in the stamina and pollen of the male flower.

The present Article, then, embraces a subject which, as we shall see before arriving at the end, will conduct us to momentous issues. Its purport is to determine, on a general or metaphysical basis, what is the principiant by which the effect is formally produced in every instance of finite Efficient Causality, but with a more especial reference to such causality as is *transient*, not *immanent*. These terms will be fully considered under the Category of Action. Suffice it for the present to say, that an immanent action (strictly speaking) is one which is exercised in the same faculty that elicits it, and is of such a kind as to be incapable of being exercised in any other Subject; while a transient action is one that is exercised in a Subject really distinct from the principiant of which it is the action. A thought or volition is an instance of an immanent action; the action of fire upon water is an instance of a transient action.

The Article will comprise four Sections. In the first, the question will be resolved touching the formal principiant by which one bodily substance generates another; in the second will be discussed the formal principiant by which finite substance in general produces accidents; in the third will be determined what accidents are capable of becoming instrumental causes; the last will be occupied in resolving the question, whether accidents cause accidents without the concurrence of the substantial form.

§ 1.

THE FORMAL PRINCIPIANT BY WHICH ONE SUBSTANCE GENERATES ANOTHER.

It should be understood that the present problem includes the instrumental as well as the principal cause. Now, there are three, and only three, natural constituents of every bodily substance,—to

wit, the matter, the substantial form, (both essential constituents), and the accidents. One or other of these, then, must be the formal principiant by which one bodily substance generates another. It remains to determine which of them it is.

PROPOSITION CCXLII.

It is evident that primordial matter cannot be the formal principiant by which one bodily substance generates another.

This Thesis hardly needs any declaration. For, since primordial matter is a pure passive potentiality, it can have no activity in itself and, consequently, no Efficient Causality.

PROPOSITION CCXLIII.

No accidental form can become the principal formal principiant by which one bodily substance generates another.

As has been explained in the second Section of the first Article of this Chapter (Division III), a principal cause is one that by a virtue nobler than, or at least equally noble with the effect, has its influx into the effect produced. For nothing can give that which is not in its own power to give, except as a mere medium for conveying the gift; and in this case it would be only an instrumental, not a principal cause. But every accidental form is essentially inferior to any whatsoever substantial form, and accordingly can contain this latter neither actually nor virtually nor *à fortiori* eminently in itself. Therefore, neither has it the virtue itself nor can it dignify the supposit or *principium quod* with the virtue, by which the latter may be able to educe the substantial form out of the potentiality of the matter.

PROPOSITION CCXLIV.

The substantial form is the principal formal principiant by which one bodily substance generates another.

THIS THESIS IS PROVED BY THE FOLLOWING ARGUMENTS.

I. It has been already established by process of exhaustion. The said formal principiant, as has been pointed out, must be either the matter, the substantial form, or the accidents. But in the

two previous Propositions it has been shown, that this cause cannot be either the matter or any of the accidents. Therefore, it must be the substantial form.

II. Operation follows being; since the latter is the first act, the former the second. Accordingly, that which gives specific being to material substance, will be the principal formal principiant of its natural operation. But it is the substantial form that gives to material substance its specific nature. Therefore, etc.

III. The substantial form cannot be altogether eliminated from the Efficient Causality of material substance; since it is the source of the specific being of each body as well as of all its properties. But it cannot be a mere instrumental principiant; because, within the limits of that substance of which it is the form, it is chief. Wherefore, within the same limits it cannot be obnoxious to that inferiority, dependence, and subjection, which instrumental causality connotes.

IV. The above arguments are confirmed by the consentient authority of all the Doctors of the School.

PROPOSITION CCXLV.

Accidents are the instrumental causes by means of which one bodily substance generates another.

THIS THESIS IS PROVED BY THE THREE FOLLOWING ARGUMENTS.

I. The first argument is *à priori*. Formally speaking, the substantial form is solely responsible (so to say) for the first act by which the substantial composite is constituted in being,—in other words, by which the matter is actuated according to the determination of a specific nature, and becomes an integral body. The second act, which is the act of natural operation, is terminated to an accident, and in consequence naturally postulates an accident as its proximate and instrumental cause. But the act of generation of bodily substance is included in the natural operation of bodily substance. Therefore, etc. To explain: In every case in which the essential nature and natural operation are really distinct,—that is to say, in all finite being,—the term, effect, or result of natural operation is accidental to the agent, even though in the Subject of causality it should be substantial. No finite essence can produce anything that forms an essential part of itself; otherwise, *pro tanto*

it would be self-existent and so not finite. Thought or volition in a man is only an accident. It comes and goes; yet *the Me* remains unchanged. The fire in the kindled faggots forms no part of the essential nature of the match by which it has been generated. Since, then, all operation of finite being is terminated to that which is an accident to the agent, and since the formal intention of the substantial form regards the first act,—viz. of being; it follows according to foundation of order, that the accidental term of operation should have for proximate cause an accidental principiant, since like generates like. Yet such accidental principiant can only be an instrumental cause from the very nature of an accident; for all accident, as such, has being and operation by virtue of the substance from which it springs and by which it is sustained.

II. The Proposition is likewise proved *à posteriori* by unexceptionable facts of experience. In inanimate substances compound bodies are generated by those *seminales rationes*, or active and passive qualities in the elements, which are properties—and consequently accidents—of the elements themselves. There are two reasons why the substantial forms cannot be supposed to act directly. One is, that they recede into the potentiality of matter, and no longer exist, at the moment that the new compound is constituted. And this is an irrefragable reason. The other is, that if the substantial forms acted immediately, it would be impossible to account for the necessity of relative proportions; since a substantial form is only indirectly subject to quantity. In living substances, however, the facts are clearer. The pollen, by which the germ-cell in the ovary is fertilized, forms no part of the essence of the parent plant; otherwise, the plant would be without a portion of its essence during the greater part of each year, and in parting with its pollen would lose a part of its essence, thereby ceasing to be an integral plant. So it is in the other methods of vegetative reproduction. The same holds good without exception in all instances of animal reproduction. After a manner somewhat similar, all the sensile cognitions, generated in the mind of man, result proximately from the causal action of the accidents of bodies on the organs of sense; though these are examples, as is plain, of the generation of accidents.

III. These arguments are confirmed by the general consent

of the peripatetic and Scholastic Doctors. St. Thomas in particular is most explicit. 'The change,' he writes, 'which has a substantial form for its term, is not produced immediately by the substantial form, but by means of active and passive qualities which act by virtue of the substantial form[1].' Again: 'The fact itself that an accidental form is principiant of action, this latter receives from the substantial form; and therefore the substantial form is the primary principiant of action, but not the proximate[2].' Once more: 'In natural actions substantial forms are not the immediate principiant of action; but they act by the medium of active and passive qualities as their proper instruments. . . . Accordingly, qualities act, not only by their own virtue but likewise by virtue of the substantial form. Hence, their action is terminated, not only to an accidental form but likewise to a substantial form. And this is the reason why generation is the term of alteration. Now, they receive an instrumental virtue of such kind, for the very reason that they are caused by essential principiants[3],'—that is to say, because these qualities flow from the essence.

Note I.

The doctrine enunciated in the three previous Propositions gives rise to two questions of grave importance. The one is: How is it precisely to be understood, that accident is the instrumental cause in the generation of bodily substance? The other is a correlative of the former: In what sense is the substantial form the principal formal cause? These two questions involve two difficulties: (i). Supposing that accident is the instrumental cause in the production of bodily substance; does this instrumental causality

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[1] 'Immutatio quae est ad formam substantialem, non fit a forma substantiali immediate, sed mediantibus qualitatibus activis et passivis, quae agunt in virtute formae substantialis.' 3^{ae} lxxvii, 3, 3^{m}.

[2] 'Hoc ipsum quod forma accidentalis est actionis principium, habet a forma substantiali; et ideo forma substantialis est primum actionis principium, sed non proximum.' 1^{ae} lxxvii, 1, 4^{m}.

[3] 'In actionibus naturalibus formae substantiales non sunt immediatum actionis principium, sed agunt mediantibus qualitatibus activis et passivis sicut propriis instrumentis. . . . . Et ideo qualitates non solum agunt in virtute propria, sed etiam in virtute formae substantialis. Unde actio earum non solum terminatur ad formam accidentalem, sed etiam ad formam substantialem; et propter hoc generatio est terminus alterationis. Hujusmodi autem virtutem instrumentalem recipiunt eo ipso quod a principiis essentialibus causantur.' 4 *d.* xii, *Q.* 1, *a.* 2, *q*, 2, *c.*

postulate that the accident should immediately conspire towards the eduction of the substantial form, or is it enough that it should dispose the matter for the evolution of the said form? (ii). On the supposition that accident immediately effects the eduction of the substantial form; does the substantial form of the agent proximately contribute, together with the instrumental accidents, towards the eduction of the form from the matter and towards the substantial effect, or only remotely and as it were radically?

Note II.

This is the place to interpose a more detailed statement of the Scholastic doctrine touching principal and instrumental causes, more particularly the latter; since the remainder of this Section will be devoted to the consideration of the instrumental action of accidents in the generation of bodily substance. The following principal points have been gathered from the teaching of the Angelic Doctor:

i. St. Thomas thus sets before us, although indirectly, the great difference between a principal, and an instrumental cause. 'To do or move certain things,' he writes, 'is predicated in two ways: First, as by the formal principiant of operation or motion; and so understood, the motion of that which causes motion or the operation of that which operates is necessarily terminated to that which it effects. For fire does not heat the heat by which it gives heat: Secondly, as by an instrument; and in this sense the active movement of that which causes motion is terminated to that which it moves. Thus, the hand moves a stone by means of a stick, and' to this end 'moves the stick[1].' An explanation of the above passage, which its apparent obscurity seems to demand, will introduce us to the more important points of teaching connected with instrumental agency. St. Thomas here sets before us two kinds of formal principiants,—the one principal, the other instrumental. The former may be thus explained. No finite substantial form exercises its natural operation immediately by virtue of its own unaided energy, for reasons already suggested in the last Proposition. It

[1] 'Operari aliqua, sive movere, dicitur dupliciter. Uno modo sicut principio formali operationis vel motus; et sic oportet quod motio moventis vel operatio operantis terminetur ad id quod operatur; non enim ignis calefacit calorem quo calefacit. Alio modo sicut instrumento; et sic motio moventis terminatur ad id quod movet; sicut manus baculo movet lapidem, et baculo movet.' *Quol.* L. x, *a.* 7, 2[m].

needs help, so to speak. Consequently, it acts through the properties of the specific nature of which itself is the actuation, or rather act. But all properties are accidents; because, though flowing from the essence, they claim no place in the essence itself. Hence, according to Scholastic teaching all the faculties of the human soul—upper as well as lower—are properties, or accidents, that constitute no part of the essence of human nature. But since these properties, because they are properties, are an efflux from the nature of the soul; in a sort of sense they may be said to represent the soul in action. Accordingly, the action of the soul is not terminated to them. It, as it were, accompanies them, energizes, operates through them and in them. Thus, for instance, the soul of man does not think its faculty of thinking, or will its faculty of will; but thinks its thought by its thinking faculty, and wills its will in and by its volitive faculty. Similarly, in common with other animals, it sees by the faculty of sight, feels by the faculty of touch, moves from place to place by its faculty of locomotion; but it does not see its sense of sight, or feel its sense of touch, or move its power of locomotion. Precisely after the same manner, in common with all living things it assimilates, causes growth, reproduces; but it does not assimilate its faculty of assimilation, or cause growth in its faculty of growth, or reproduce its reproductive power. Its energy is represented by its faculty; and its sole term of action or operation (using action for immanent, and operation for transient activity) is the term of its faculty. It in no wise acts on the faculty itself as on a Subject. Thus, a faculty may in a generic sense be called an instrument of the substantial form, because this latter operates by and through it, and it only moves under influence of the form; but is truly reckoned as a principal cause, forasmuch as it is the active potentiality of the form. In the instance, however, of instrumental causes properly so called, the operation of the principal cause is, indeed, equally with its instrument terminated to the effect intended; but it is terminated to the effect in conjunction with a previous effect which it has produced in its instrumental cause. Thus,—to borrow the illustration of the Angelic Doctor,—the hand of man moves the stick, and, in union with the motion communicated to the stick, moves the stone. Hence, the principal cause has the instrument it uses as a term of its causality. In order to produce motion by and through the instrument, it first produces motion in it. St. Thomas teaches the same distinction in another

place, but with new illustrations. 'A thing acts by virtue of another,' he writes, 'in two ways; first, forasmuch as it is moved by the virtue of that other, in the way that natural heat acts by virtue of the soul: Secondly, forasmuch as the agent makes use of the virtue of an instrument,—as, for instance, the soul sees by virtue of the eye[1].' The one is a virtue of the soul; the other is an instrument whose virtue the soul uses. It will be seen at once, that the former represents an instrumental cause improperly so called; while the latter is a true and proper instrument. The above passages indicate a characteristic of all instrumental causes, whether properly or less properly so called. Wherefore,

ii. An instrumental cause is always moved to causal action by the principal formal principiant. Such is the teaching of St. Thomas. 'An instrument,' he writes, 'is never employed to cause anything, save by the way of motion; for it is the nature of an instrument, that, moved itself, it causes motion[2];'—that is to say, its causality is not automatic. It receives its causal impulsion and direction from the principal cause. Hence, as St. Thomas remarks in another place, 'An instrument is used on account of its congruity with the effect, so as to be a medium between the principal cause and the effect, and to reach both; and so that in this way the influx of the primary cause may arrive at the effect by means of the instrument. Wherefore, there must be something receiving the influx of the principal cause, in that which is caused by means of an instrument[3].' This last sentence needs a word of explanation. The Angelic Doctor is engaged in proving, that God alone of Himself has the power to create, and that He could not employ any finite cause as an instrument. His argument is this: If an instrumental cause is a medium between the principal cause and the effect, and is made use of on account of its congruity with the effect to be produced; it follows that there

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[1] 'Aliquid agit virtute alterius dupliciter; uno modo inquantum movetur a virtute illius, sicut calor naturalis agit in virtute animae; alio modo inquantum aliquod agens utitur virtute alicujus instrumenti, sicut anima videt virtute oculi.' *Unio. a.* 5, 5[m].

[2] 'Instrumentum autem nunquam adhibetur ad causandum aliquid nisi per viam motus; est enim ratio instrumenti quod sit movens motum.' *Cg. L. II,* c° 21, *n.* 4°.

[3] 'Instrumentum adhibetur propter convenientiam ejus cum causato, ut sit medium inter causam primam et causatum, et attingat utrumque, et sic influentia primi perveniat ad causatum per instrumentum. Unde oportet quod sit aliquid recipiens primi influentiam, in eo quod per instrumentum causatur.' *Ibidem, n.* 5.

must be some recipient of the influx of the principal cause,—something presupposed to, and Subject of the effect. The reason is, that, if the effect were created, the instrument would have no proper term of its action and no foundation of congruity. A saw is between the carpenter's hand and the wood, and has its own power of severing the latter; but, if the table were created in its perfected form, of what use would the saw be? To resume: The rest of the passage conveys clearly the absolute dependence of the instrumental on the principal cause for the initiation of its motion. In the following passage St. Thomas gives an intimation touching the nature of this motion. 'An instrument,' he remarks, 'exercises instrumental action in so far as it has been moved by the principal agent; and by means of this motion it participates to a certain extent in the virtue of the principal agent: not in such wise as that this virtue is in the instrument according to its perfected nature, because motion is an imperfect act[1].' This is a fact of some importance in regard of an instrumental cause. In an instrument the virtue communicated by the principal agent is not so much *in act* as *acting*. The instrument gives passage to, but does not retain as its own, the principal energy of the agent. Hence,

iii. An instrumental cause always extends itself to some effect beyond its own proper competency. 'The Efficient Cause,' writes St. Thomas, 'admits of a twofold division; one, on the part of the effect, into the disposing' cause 'which causes the ultimate disposition for the ultimate form, and a perfecting' cause 'which introduces the ultimate perfection,'—the integral constitution of the entity. 'The other is on the part of the cause itself, viz. into a principal and an instrumental agent. For a principal agent primarily imparts motion; while an instrumental agent is itself moved before imparting motion. Now, there is a twofold action that belongs to an instrument: one which it has of its own proper nature; the other which it has as receiving motion from the principal agent. Just as the heat of fire has of its own nature the power of dissolving and of consuming and such like effects; but forasmuch as it is the instrument of the vegetative soul' in

[1] 'Instrumentum agit actionem instrumentalem, inquantum est motum ab agente principali, per quem motum participat aliqualiter virtutem agentis principalis, non ita quod virtus illa sit in instrumento secundum esse perfectum, quia motus est actus imperfectus.' *Verit. Q.* xxvi, *a.* 1, 8^{m}.

an animal, 'it generates flesh. Now, you should know that the action of an instrument sometimes extends to the ultimate perfection which the agent introduces, but sometimes not; always, however, it extends to something beyond that which is competent to itself according to its own nature,—whether this something be the ultimate form or a disposition; otherwise, it would not act as an instrument. Thus, the active and passive qualities of the elements extend instrumentally to the eduction of material forms out of the matter[1].' According to the Angelic Doctor, then, a cause could not be instrumental, unless its efficiency should reach to some effect that transcends its own native energy,—an efficiency communicated to it by the principal cause. Thus,—to repeat the illustration he gives,—the vital heat, which is a property of animal life, contributes of its own nature to the chemical analysis of the compounds present in the food; but it contributes towards the transformation of the elements into flesh,—an effect wholly beyond its own natural competency,—through the virtue which it has received as instrumental cause from the animal soul. But,

iv. It really, though subordinately, assists towards the result by an inferior virtue of its own; as the last example helps us to understand. 'A secondary' (finite) 'instrumental cause,' says St. Thomas, 'does not share in the action of a superior cause, save in so far forth as it operates dispositively, by means of something proper to itself, towards the effect of the principal agent. If, therefore, it should do nothing thereto by means of something of its own, it would be employed in vain for purposes of operation[2].'

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[1] 'Causa efficiens dupliciter potest dividi. Uno modo ex parte effectus; scilicet in disponentem, quae causat dispositionem ad formam ultimam; et perficientem, quae inducit ultimam perfectionem. Alio modo ex parte ipsius causae, in agens principale, et instrumentale. Agens enim principale est primum movens, agens autem instrumentale est movens motum. Instrumento autem competit duplex actio: una quam habet ex propria natura, alia quam habet prout est motum a primo agente; sicut calor ignis, qui est instrumentum virtutis nutritivae, ut dicitur in 2 de Anima, ex natura propria habet dissolvere, et consumere, et hujusmodi effectus; sed inquantum est instrumentum animae vegetabilis, generat carnem. Sed sciendum, quod actio instrumenti quandoque pertingit ad ultimam perfectionem, quam principale agens inducit, aliquando autem non; semper tamen pertingit ad aliquid ultra id quod competit sibi secundum suam naturam, sive illud sit ultima forma, sive dispositio; alias non ageret ut instrumentum. Sic qualitates activae et passivae elementorum pertingunt instrumentaliter ad formas materiales educendas de materia.' 4 *d.* i, *Q.* 1, *a.* 4, *q.* 1, *c.*, *p. m.*

[2] 'Causa secunda instrumentalis non participat actionem causae superioris, nisi in

In these last words we are provided with a cogent reason for this fresh characteristic of an instrumental cause. An instrument is appropriated to, or selected by, the principal agent,—accordingly as this latter is unintelligent or intelligent,—for two reasons. The one is derived from the relative impotency of the principal cause, which cannot produce the effect without help; the other, from the nature of that which serves for instrumental cause. This latter reveals an obediential capacity in the given entity for receiving the influx of the superior cause; but, besides such capacity, it exhibits a native aptitude for producing an effect in furtherance of the ultimate operation of the principal agent. To take an instance: A carpenter cannot saw a piece of oak with his fingers; and accordingly he looks out for help. He chooses a saw. But why? Because by means of its teeth it has an aptitude for cutting the wood in two. Thus the tool plays its own part in the construction of the door (we will say) by an efficiency exclusively its own; while it obeys the directing influx of the carpenter in the particular motion by which the door-form is produced. The carpenter would never dream of pressing water into his service. Why? Because water has no capacity for receiving the directive motion, and has nothing in its own nature that could be auxiliary to the intended effect. That, therefore, can never be an instrument, which has no efficiency in some way or other cognate with the intended effect. Hence,

v. The instrumental cause produces a double effect,—one by its own unaided efficacy, the other beyond its proper causality, the result of a motion communicated to it by the principal agent. 'Whensoever,' writes the Angelic Doctor, 'there are two agents in order of relation, the inferior agent has a capacity for imparting motion or for acting, in two ways: First, in accordance with the competency of its own nature; secondly, in accordance with the competency of the nature of the superior agent. For the impress of the superior agent remains in the inferior; and hence the inferior agent acts, not only by its own proper action but by the action of the superior agent. . . . And though no action of an inferior agent takes place, save on the presupposition of the action of the superior agent; nevertheless, that action which is within its own competence according to its nature is attributed to it

quantum per aliquid sibi proprium dispositive operetur ad effectum principalis agentis. Si igitur nihil ibi ageret, secundum illud quod est sibi proprium, frustra adhiberetur ad agendum.' 1ae xlv, 5, *c.*, *p. m.*

absolutely, . . while that which is competent to it by virtue of the impress of a superior agent, is not attributed to it absolutely but as subordinate to another[1].' So again: 'An instrument has two actions,—the one instrumental, by which it operates, not in its own nature but in virtue of the principal agent. It has besides another action of its own, which belongs to it in accordance with its own form; just as it is in the power of an axe to *cut* by reason of its own sharpness, while it fashions a bed inasmuch as it is an instrument of art. But it does not accomplish its instrumental action, save by exercising its own proper action; for by cutting it fashions the bed[2].' Once more: 'The action of that which is moved by another' (an instrumental cause) 'is twofold; viz. one which it has in accordance with its own form, the other which it has accordingly as it is moved by another. Just as, for instance, the operation of an axe according to its own form is to cut; but, as moved by the workman, its operation is to make a bench. The operation, then, which is within the competency of an entity by virtue of its own form, is its own; and does not belong to that which moves it, save in so far as this latter uses a thing of the sort for its own operation. Thus, for instance, to give heat is the proper operation of the fire, and not of the blacksmith; except as he makes use of the fire to heat the iron. But that operation which belongs to an entity only as moved by another, is no other than the operation of that which imparts motion to it. Thus, to make a bench is not the operation of the axe apart from the operation of the workman; but the axe has its share instrumentally in the operation of the workman[3].' 'Thus'—to sum up in the

[1] 'Quandocunque sunt duo agentia ordinata, secundum agens dupliciter potest movere vel agere: uno modo secundum quod competit naturae suae; alio modo secundum quod competit naturae superioris agentis; impressio enim superioris manet in inferiori; et ex hoc inferius agens non solum agit actione propria, sed actione superioris agentis. . . . . Et quamvis nulla actio inferioris agentis fiat nisi praesupposita actione superioris; tamen illa actio quae competit ei secundum suam naturam, attribuitur ei absolute, sicut aquae moveri deorsum; illa vero quae ei competit ex impressione superioris agentis, non attribuitur ei absolute, sed in ordine ad aliud.' *Verit. Q.* xxii, *a.* 13, *c.*

[2] 'Instrumentum habet duas actiones: unam instrumentalem, secundum quam operatur non in virtute propria, sed in virtute principalis agentis; aliam autem habet actionem propriam, quae competit ei secundum propriam formam; sicut securi competit scindere ratione suae acuitatis, facere autem lectum, inquantum est instrumentum artis; non autem perficit instrumentalem actionem, nisi exercendo actionem propriam; scindendo enim facit lectum.' 3^{ae} lxii, 1, 2^{m}.

[3] 'Actio ejus quod movetur ab altero, est duplex: una quidem quam habet

words of the Angelic Doctor,—'an instrument has two operations; one that is within its competency according to its own form, the other that is within its competency, accordingly as it is moved by an independent agent. And this latter surpasses the virtue of its own form[1].' The above declarations of the Angelic Doctor are so clear, that they require no comment. It may be well, however, to add one remark. An instrumental cause does not produce its twofold effect, in the sense that the two effects are physically separate and independent. On the contrary, the principal cause produces the ultimate effect through the proximate effect of the instrumental cause; so that the former may be counted as a sort of evolution of the latter.

vi. It follows from the previous headings, that there is nothing to prevent an instrumental cause from producing an effect, under motion of a superior agent, which is entirely beyond the competency of its own unassisted nature. 'Now, an effect,' writes St. Thomas, 'is said to be in the cause after a twofold manner; first, in that the cause has dominion over its effect, just as our actions are said to be in us. In this sense, then, there is no effect in an instrumental cause, which does not impart motion unless first moved itself. . . . Secondly, by virtue of a likeness of itself; in that a cause produces an effect like itself. This takes place in four ways. First: When the likeness of the effect is in the cause according to natural being and in the same specific nature; as is the case in the instance of univocal causes. After this sort it may be said, that the warmth of the air is in the fire that warms. Secondly: When the likeness of the effect is in the cause according to natural being, but not according to the same specific nature; as may be plainly seen in the instance of equivocal causes. After

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secundum propriam formam; alia autem quam habet secundum quod movetur ab alio: sicut securis operatio secundum propriam formam est incisio; secundum autem quod movetur ab artifice, operatio ejus est facere scamnum. Operatio igitur quae est alicujus rei secundum suam formam, est propria ejus, nec pertinet ad moventem nisi secundum quod utitur hujusmodi re ad suam operationem; sicut calefacere est propria operatio ignis, non autem fabri nisi quatenus utitur igne ad calefaciendum ferrum. Sed illa operatio quae est rei solum secundum quod movetur ab alio, non est alia praeter operationem moventis ipsam; sicut facere scamnum non est seorsum operatio securis ab operatione artificis; sed securis participat instrumentaliter operationem artificis.' 3ae xix, 1, *c.*

[1] 'Sic instrumentum habet duas operationes; unam quae competit ei secundum formam propriam; aliam quae competit ei secundum quod est motum a per se agente, quae transcendit virtutem propriae formae.' *Verit. Q.* xxvii, *a.* 4, *c.*, *v. fi.*

this sort, the heat of the air is in the sun. Thirdly: When the likeness of the effect is in the cause, not according to physical but according to spiritual being,—*in rest*, however; as the likeness of works of art is in the mind of the artificer. For the form' or plan 'of the house in the builder is not a nature of some sort, as is the warming power in the sun or the heat in fire; but is a certain intellectual concept resting in the mind. Fourthly: When the likeness of the effect is not in the cause according to the same specific form, or according to any sort of nature, or as in rest; but after the manner of a sort of deflux, as are the likenesses of the effects in instruments, by the means of which the forms flow forth from the principal causes into the effects[1].'

The above passage needs some explication. According to the Angelic Doctor, then, all effects whatsoever pre-exist in their causes in one of two ways. They are said to pre-exist in the cause, forasmuch as the cause has a power or dominion over its effect; as in the instance of human thoughts and volitions. Or, again, effects are said to pre-exist in their cause; forasmuch as their likeness is, in one way or another, to be found in their cause. Now, there are four different ways, according to which a likeness of the effect may pre-exist in its cause. (i.) The likeness of an effect may pre-exist in its cause; because the effect possesses the same specific nature as its cause. Consequently, it finds its *specific* likeness in the form and nature of the latter. Thus, for instance, the likeness of the child pre-exists in the specific nature of its

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[1] 'Effectus autem dicitur esse in causa dupliciter. Uno modo secundum quod causa habet dominium super effectum, sicut actus nostri dicuntur esse in nobis: et sic nullus effectus est in causa instrumentali, quae non movet nisi mota. . . . Alio modo per sui similitudinem, secundum quod causa producit effectum sibi similem; et hoc contingit quatuor modis. Uno modo, quando similitudo effectus est in causa secundum esse naturale, et secundum eamdem rationem, sicut est in effectibus univocis; per quem modum potest dici quod calor aëris est in igne calefaciente. Secundo quando similitudo effectus est in causa secundum esse naturale, sed non secundum eamdem rationem, sicut patet in effectibus equivocis, per quem modum calor aëris est in sole. Tertio modo quando similitudo effectus est in causa non secundum esse naturale, sed spirituale, tamen quietum, sicut similitudines artificiatorum sunt in mente artificis: forma enim domus in aedificatore non est natura quaedam, sicut virtus calefactiva in sole, vel calor in igne, sed est quaedam intentio intelligibilis in anima quiescens. Quarto modo quando similitudo effectus non secundum eamdem rationem, nec ut natura quaedam, nec ut quiescens, sed per modum cujusdam defluxus est in causa; sicut similitudines effectuum sunt in instrumentis, quibus mediantibus defluunt formae a causis principalibus in effectus.' *Verit. Q.* xxvii, *a.* 7, *c.*

parent; and similarly in the reproduction of all living things. So,—to adduce an example from accidental effects,—the heat produced in a bar of iron finds its specific likeness in the heat of the agent fire. Such likeness is to be found in univocal causes only. (ii.) The likeness of the effect may pre-exist in its cause; because the effect possesses the same generic, though not the same specific, nature as its cause. Consequently, the likeness is *generic*. Of such kind is the likeness which pre-exists in the sun to its effects of light and heat. This likeness is to be found in equivocal causes only. (iii.) The likeness of the cause to its effect may be *intentional* only, not discoverable in the nature of each either generically or *à fortiori* specifically regarded. In the cause is preconceived the intellectual form or plan of the work to be produced. Such likeness is discoverable in exemplar causes only. Thus, for instance, the likeness of the building exists beforehand in the mind of the architect. It is plain, that neither the mind of the architect nor his conception bears any physical resemblance to the house he builds. These are spiritual; while the house is material. Yet there is a likeness of some sort to the house in the artistic idea. So far the doctrine is plain. But there are two difficulties which confront us. First of all, an exemplar cause is not an Efficient Cause; consequently, it has no business to be in the division at all. Then, in the second place, what does St. Thomas mean, when he says that the likeness is *resting* in the mind? For the likeness to the effect remains also in the instance of both univocal and equivocal causes; wherefore, this quiescence does not seem to particularize the exemplar cause. The following is the answer to the first difficulty. An exemplar cause, or typal concept, may be regarded in two ways. It may be considered exclusively as an exemplar cause; and, as such merely, it has no place here. It may likewise be considered as a spiritual quality, existing in the mind of the agent and proximately disposing and directing him towards the production of his work; and so it is included under the principal Efficient Cause, as though integrating the causal efficiency of this latter. The second difficulty is thus resolved. In all the other cases wherein a likeness to its effect is precontained in the cause, the nature (which is in some way foundation of the likeness) operates that which is the likeness of itself in the effect, by a real physical movement in the Subject of the effect; but it is not so with the mind of

the artist in the execution of his work. The artistic idea remains quiescent in the mind, and has no physical influx into the work that is produced. It is directive, not immediately productive; and in this it is distinguished from all other causes that contain a likeness of their effect. (iv.) Lastly: There are some causes, whose likeness to the effects they help to produce is not original, but communicated by another,—is transitory, a motion rather than a resting likeness; in other words, the likeness exists only in a virtue lent to the cause for a time by a superior cause, in order that the former may conspire by its own natural operation, thus aided, towards the production of an effect that finds no likeness of itself in such cause, or in the cause's native virtue. Thus these causes differ in two respects from the preceding class; first, in that the likeness to the effect is adventitious and transitory,—is not a likeness in stable rest, but passing through with the causal motion; secondly, because these last-named causes exercise a physical influence in the production of the effect. Such are instrumental causes. Since, then, they act in virtue of a superior cause; there is nothing to prevent them from becoming co-efficients of an effect, removed far above their own unaided efficacy. Accordingly, the Angelic Doctor observes that 'there is nothing to hinder an instrumental cause from producing an effect above its own nature[1];' and again, referring especially to the instrumentality of accidents in natural generation, he observes: 'An active quality, like heat, although it is an accident, yet acts in virtue of the substantial form as its instrument; and therefore can act towards the production of a substantial form. . . . Nor is it contrary to the nature of an accident, that it should exceed its Subject in its action; but that it should exceed it in its being[2].'

vii. It is a direct consequence of the teaching embodied in the previous heading, that an instrumental cause need not be more noble than, or as noble as, its effect; but that, on the contrary, as a rule it should be inferior to its effect. As St. Thomas observes, 'Cause is twofold. One is the principal, which acts by virtue of its

[1] 'Nihil autem prohibet causam instrumentalem producere potiorem effectum.' 3^{ae} lxxix, 2, 3^{m}.

[2] 'Qualitas enim activa, ut calor, etsi sit accidens, agit tamen in virtute formae substantialis, sicut ejus instrumentum; et ideo potest ad formam substantialem. . . . Nec est contra rationem accidentis quod excedat suum subjectum in agendo, sed quod excedat in essendo.' 1^{ae} cxv, 1, 5^{m}.

own proper form; and this, as cause, is nobler than its effect. The other is the instrumental cause; which does not act by virtue of its own proper form, but only as it is moved by another. And it is not necessary that this cause should be more noble than the effect; just as the saw is not more noble than the house[1].'

viii. Accordingly, it is not necessary that an instrumental cause should contain in its own nature a likeness to the effect towards the production of which it contributes. 'A principal agent,' says St. Thomas, 'and an instrumental cause differ in this; that the instrumental agent does not introduce its likeness in the effect, but a likeness of the principal agent. On the other hand, the principal agent does introduce its likeness. Wherefore, by this an entity is constituted a principal agent, viz. that it possesses a certain form which it is capable of transfusing into some other. But an instrumental agent is not constituted in this way, but as the result of its being applied by the principal agent to the production of some effect[2].'

ix. It further follows, that an instrumental cause does not itself need to possess the form which it helps to produce. Here once more St. Thomas is our authority. 'A principal agent,' he says, 'since it operates that which is a likeness of itself, must needs possess the form which it introduces' into the Subject 'by means of its action in the case of univocal agents; or in that of not-univocal agents it must possess some nobler one. But it is not necessary that an instrumental agent should possess the form which it introduces, as though disposing itself,'—that is to say, as though it should require such form as a necessary disposition for its operation; 'but only after the manner of an *intention*, as is plainly seen in the example of the form of the bench in the saw[3].' The meaning of

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[1] 'Duplex est causa. Una principalis quae agit per propriam formam; et haec est nobilior quam effectus inquantum est causa. Alia est causa instrumentalis, quae non agit per formam propriam sed inquantum est mota ab alio; et hanc non oportet nobiliorem effectu, sicut serra non est nobilior quam domus.' *Ma. Q.* iv, *a*, 1, 15m.

[2] 'Agens per se et agens instrumentale in hoc differunt, quod agens instrumentale non inducit in effectu similitudinem suam, sed similitudinem principalis agentis. Principale autem agens inducit similitudinem suam; et ideo ex hoc aliquid constituitur principale agens, quod habet aliquam formam, quam in alterum transfundere potest: non autem ex hoc constituitur agens instrumentale, sed ex hoc quod est applicatum a principali agente ad effectum aliquem producendum.' 4 *d.* xix, *Q.* 1, *a.* 2, *q.* 1, *c.*

[3] 'Agens autem principale, cum agat sibi simile, oportet quod habeat formam, quam inducit per suam actionem in agentibus univocis, vel aliquam nobiliorem in

the Angelic Doctor may be put in this way. Since a principal Efficient Cause introduces into the Subject a form that is a generic or specific likeness of its own by its own virtue, there is an evident necessity that the said cause should possess either formally or eminently the form which it introduces; because, on any other hypothesis, it would not possess the requisite disposition for the specific production. But there is no similar need in the case of an instrumental cause; because its disposition and motion are lent to it by the principal agent that operates through and in it. Nevertheless, an instrumental cause is not wholly destitute of something akin to a likeness of the form, which it subordinately helps to introduce into the Subject. For, seeing that its motion and action are intentioned to such end, by the directive action of the principal cause; this motion bears a transient semblance to the form which is, as it were, passing through it from the agent to the Subject. It carries along with it the intention of the superior cause. For so long as it continues, it is a symbol of the effect to be produced. We can see an illustration of this in works of art. A skilled spectator can soon discern, from the peculiar motion of the chisel, the new feature that is being introduced in the stone. Such, indeed, is the explanation which St. Thomas offers in another place. 'An agent'—these are his words—'does not invariably give to the instrument a new form or virtue that abides in it; and yet the instrument, as moved by the agent, gains a sort of intentional virtue by the influx of the agent who, through the medium of the instrument, passes into the effect[1].' It is particularly noticeable, how in this passage St. Thomas plainly intimates that such an abiding form or virtue may be communicated to the instrument; as *de facto* it often is. He only asserts that such communication is not invariable. One other passage from St. Thomas, bearing upon the present subject, shall be quoted; as it serves to throw some light upon his use of the term, *intention*, in the passages just cited. 'The virtue of the action,' he writes, 'is proportioned to the agent. Hence, it is necessary to understand the virtue of acting in the

agentibus non univocis. Sed agens instrumentale non oportet quod habeat formam quam inducit ut disponentem ipsum, sed solum per modum intentionis, sicut de forma scamni in serra patet.' 4 *d.* v, *Q.* 2, *a.* 2, *q.* 2, *c.*

[1] 'Agens non semper dat instrumento novam formam vel virtutem quiescentem in ipso; et tamen instrumentum, inquantum movetur ab agente, consequitur quamdam intentionalem virtutem per influxum agentis, qui per instrumentum transit in effectum.' *Unio. a.* 5, 12[m].

principal agent after one manner; after another, in the instrumental agent. For a principal agent acts according to the exigency of its form; and, consequently, the active virtue in it is a certain form or quality, having a complete entity in nature. But an instrument acts, as it is moved by another; and, consequently, there belongs to it a virtue proportioned to the motion. Now, motion is not a complete entity, but is a road to entity,—something midway, as it were, between pure potentiality and pure act; as it is said in the fifth Book of the *Physics*. Consequently, the virtue of an instrument *as such*,—that is to say, accordingly as it operates towards an effect which is beyond its own natural competency,—is not a complete entity having a stable being in nature; but a sort of incomplete entity, such as is the power in the air of producing a change in the organ of sight, in so far as the air is an instrument moved by the external object of vision. And entities of this sort are wont to be called intentions, and bear some resemblance to the entity in the soul, which is an attenuated entity, as it is called in the sixth Book of the *Metaphysics*[1].' The term is used by the School, not only to express the concepts and forms of thought, but likewise the impressions received in the sensible faculties of the soul.

x. The causality of an instrumental agent, *qua* instrumental, is imperfect in its nature; because it results from impulsion given by the principal cause, and its virtue is communicated and transient. Hence, as the causality of the instrumental agent is immediate,—that is to say, as the instrument immediately produces the effect; so likewise the principal cause does not serve itself of the instrument in such sort, that its own causality is not immediate. The water flows through the pipe, and the pipe immediately abuts upon

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[1] 'Virtus agendi proportionatur agenti. Unde alio modo oportet ponere virtutem agendi in agente principali; alio modo in agente instrumentali. Agens enim principale agit secundum exigentiam suae formae; et ideo virtus activa in ipso est aliqua forma vel qualitas habens completum esse in natura. Instrumentum autem agit ut motum ab alio; et ideo competit sibi virtus proportionata motui: motus autem non est ens completum sed est via in ens quasi medium quid inter potentiam puram et actum purum, ut dicitur in 3 Physic. Et ideo virtus instrumenti inquantum hujusmodi, secundum quod agit ad effectum ultra id quod competit sibi secundum suam naturam, non est ens completum habens esse fixum in natura, sed quoddam ens incompletum, sicut est virtus immutandi visum in aëre, inquantum est instrumentum motum ab exteriori visibili; et hujusmodi entia consueverunt intentiones nominari, et habent aliquid simile cum ente quod est in anima, quod est ens diminutum, ut dicitur in 6 Metaphys.' 4 *d.* i, *Q.* 1, *a.* 4, *q.* 2, *c.*

the cistern; but the water likewise immediately reaches the cistern through the pipe. Of the two assertions just made, the former is thus clearly maintained by the Angelic Doctor: 'An instrument does not operate, save in so far forth as it is moved by the principal agent which operates in its own right. Consequently, the virtue of the principal agent has a permanent and complete being in nature, while an instrumental virtue has a being that passes from one to another, and is incomplete; just as motion in like manner is an imperfect act from the agent to the recipient[1].' It must be remembered, that (as has been pointed out under the second Number in the present Note) an instrumental cause acts by way of motion. But, if its causality is by way of motion, it must be of an imperfect nature; because motion itself is a most imperfect entity midway, as St. Thomas puts it, between pure potentiality and pure act. The same Doctor confirms the second assertion in the following instructive passage: 'In every agent there are two points to be considered; viz. the entity itself that acts and the virtue by which it acts; as, for instance, fire gives warmth by means of heat,' which is a property or accident of fire. 'Now, the virtue of an inferior agent depends upon the virtue of the superior agent, forasmuch as the superior agent gives to the inferior agent the very virtue by which the latter acts, or preserves it, or likewise applies it to operation; just as the artisan applies the instrument to the required effect, and yet sometimes neither gives nor preserves to the instrument a form by means of which it may act, but only gives it motion. It is necessary, therefore, that the action of the inferior agent should proceed from it, not only by its own virtue but by virtue of all the superior agents; for it acts in virtue of all. Further: As the most inferior agent is seen to be immediate in its activity; so the virtue of the principal agent is seen to be immediate in the production of the effect[2].' There is a remark

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[1] 'Instrumentum non operatur nisi inquantum est motum a principali agente, quod per se operatur. Et ideo virtus principalis agentis habet permanens et completum esse in natura; virtus autem instrumentalis habet esse transiens ex uno in aliud, et incompletum; sicut et motus est actus imperfectus ab agente in patiens.' 3^{ae} lxii, *a.* 4, *c.*

[2] 'In quolibet enim agente est duo considerare, scilicet rem ipsam quae agit et virtutem qua agit; sicut ignis calefacit per calorem. Virtus autem inferioris agentis dependet a virtute superioris agentis, inquantum superius agens dat virtutem ipsam inferiori agenti per quam agit, vel conservat eam, aut etiam applicat eam ad agendum; sicut artifex applicat instrumentum ad proprium effectum, cui tamen interdum

in this quotation that we have seen before; but it is very necessary to direct again the attention of the reader to the point, as being one of considerable importance in relation to future discussions. *An instrumental cause, more particularly in the operations of nature, sometimes receives from the principal agent a form impressed in it, by virtue of which it acts;* though as frequently it does not receive any such form. Hence, there are two classes of instrumental causes, corresponding with this difference in their constitution as instruments. An apt illustration may be taken from the process of moulding metal. A founder by means of his hands and the fitting instruments prepares the tube of wax that is designed to give shape to the substance. His tools have received from him no form by virtue of which they act, but merely a directive motion; the wax, however, has received an inherent form, by virtue of which it produces a counterpart in the metal. But, in every case without exception, the instrumental receives its initial motion from the principal agent.

Thus armed, we shall be now fully prepared for the discussion of the interesting problems that await us.

PROPOSITION CCXLVI.

It cannot be reasonably denied, that accidents are in such wise instrumental causes of the production of material substances, as proximately and of their own nature to contribute towards the eduction itself of the substantial form.

Prolegomenon.

The difficult question that is submitted to discussion and examination in this and succeeding Theses, turns upon the nature of the Efficient Causality,—or rather upon the principiants of the Efficient Causality,—by which the substantial form is educed out of the potentiality of matter, and the composite substance generated. It has been already declared in previous Propositions, that the substantial form and the accidents are joint principiants of the causality by which a new body is generated in the natural order,—the

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formam non dat per quam agit instrumentum, nec conservat, sed dat ei solum motum. Oportet igitur quod actio inferioris agentis non solum sit ab eo per virtutem propriam, sed per virtutem omnium superiorum agentium; agit enim in virtute omnium: Et sicut agens infimum invenitur immediatum activum; ita virtus primi agentis invenitur immediata ad producendum effectum.' *Cg. L.* iii, *c°.* 70.

former as principal, the latter as instrumental Efficient Cause. But this is not enough. It is necessary to determine *how* this twofold kind of causality works. Do both the substantial form and the accidents immediately produce the effect in the Subject? Do they attain, both of them, to the eduction of the new substantial form directly or indirectly? Is their mutual co-operation a necessity? If so, in what order? Lastly: Is their physical conjunction as joint causes naturally required? or can they cause in a state of separation? If so, how?

The present Proposition limits itself to a solution of one of these problems; viz. Whether or not the causality of the accidents *directly* conspires to effect the eduction of the new substantial form, and the consequent constitution of the material substance. Touching this point two opinions have been maintained in the Schools. The one is, that the accidents do not directly cause the eduction of the form; but that they indirectly cause it by disposing the matter for the action of the principal cause. Here is the place to interpose an observation. The present inquiry does not regard the accidents which are generated in the Subject of such causality; for these, if anything, must be included under the material cause, and have assuredly nothing to do with the Efficient. It, therefore, exclusively concerns the accidents by means of which, as by instruments, the principal agent is supposed to operate. Of these, then, it has been held, that they only operate by introducing into the Subject accidents like to themselves, and that in this way they dispose the matter for the eduction of the substantial form by the principal agent; but that they in no wise directly contribute towards the actual evolution of the form. The other opinion is, that the accidents directly and immediately contribute to the said evolution. This latter opinion is defended in the present Proposition. That the accidents are only instrumental causes, has been already shown; consequently, the Thesis is reduced to one Member,—viz. that *the accidents proximately and of their own nature contribute to the eduction itself of the substantial form.*

The Proposition is proved by the following arguments:

I. The first argument is derived from extrinsic evidence. The truth of the present opinion is generally maintained by peripatetic philosophers as well as by the most eminent Doctors of the School,—notably by the Angelic Doctor. And, in a question so

comparatively obscure as the present, such authority must carry great weight with it in the mind of dispassioned and self-diffident inquirers after truth.

II. The second argument is based on experience, 'on which,' as Suarez most justly remarks, 'philosophy mainly relies.' In all instances, without exception, of the generation of living things, —whether they be plants or animals,—accidents (that is to say, things that are accidental relatively to the principal agent) are the proximate and direct causes of the eduction of the form out of the potentiality of the matter. Take the case of normal reproduction common to phanerogams. The pollen, or male sexual cells, can claim no place in the essential nature of the plant. A simple but irrefragable proof of this assertion is afforded by the fact, that the flower of the plant loses its pollen annually,—nay, even the flower itself dies with its stamens; yet the plant lives on in the identity of its own complete essential nature. In dioecious plants the pollen leaves the plant that has produced it and of which it is an accident, and becomes attached to another plant, the ovule of whose flower it fertilizes. Pollination—or the conveyance of the pollen from the anthers to the female flower—is sometimes effected by the wind, more frequently by the visits of insects; but the important point is, that in every case the pollen is separated physically from the principal agent at the moment when it begins to fertilize the ovule. Accordingly, the immediate action of the accidents in educing the plant-form and generating the embryo is manifest; the real difficulty in this matter (which will be subject of future examination) is, to defend the immediate operation of the substantial form of the parent-plant. This plain inference is further confirmed by another fact. The actual evolution of the plant from the seed takes place, when the seed is separate and generally far distant from both of the parent-plants with their substantial forms. In the instance of inorganic substances the facts of experience are perhaps less patent to sense; yet here too, with the help of metaphysical teaching, close investigation conducts us to a similar conclusion. Let us see. Take two reputed chemical elements, chlorine and hydrogen. If equal volumes of these are brought in presence of each other; under the action of heat or light they will combine to form hydrochloric acid. Now take hydrogen with another element, oxygen. These will not adequately combine in equal volume; but if the due proportion of two

volumes of hydrogen to one of oxygen be observed, the two will adequately combine under the action of heat. In each of these instances, the combination is attributed to the nature of the affinity between the two respective elements. But what is this affinity? It is plainly a special virtue or force in each; but as plainly it can form no part of the essential nature of these elements. On the contrary hypothesis these inconsequences would follow. First of all: Part of the essence of the element would be in act, part in subjective potentiality to an extraneous agent and to the accidental action of this latter. Then: No element would have its integral essence, till its affinities were exhaustively satisfied. Again: An element, or simple material substance, would be capable of being essentially perfected by an accident. Lastly: No element could be essentially complete, save in chemical combination with others;—which is tantamount to saying, that no element can possess its complete essence save by losing its complete essence. For these as well as for other grave reasons, the Doctors of the School maintain, (as has been already noticed), that all the forces, powers, faculties of finite substances, whether spiritual or material, are properties flowing from the essence, and not the essence itself or any part of it. What follows? Thus much; namely, that the proximate or instrumental cause of the generation of the new compound substance is a special affinity in one or both of the elements, and that this affinity is an accident. It is a special affinity; for even in the same element, as the examples show, it differs greatly with a difference of term. Hydrogen has an affinity for chlorine quite distinct from that which it manifests for oxygen; otherwise, there would be no sufficient reason for a different quantivalence. There is another confirmatory fact which is well worthy of attention. The two substantial forms of the elements, which are the principal formal agents in the chemical combination, are no longer existing when the new form of the compound is evolved; for the same moment that witnesses the evolution of the new form, witnesses likewise the recess of the two primitive substantial forms into the potentiality of the matter. Let us pursue the chemical synthesis. We have already an acid in store; let us now provide ourselves with a base. For this purpose take sodium, another reputed element. Bring it into contact with oxygen; it combines with this element, and a new substance, soda, is generated. Add water to the soda; the result is the generation

of another compound substance, called caustic soda. This shall serve as a base. Submit this base to the action of the hydrochloric acid, and a salt—well known as the common salt of commerce—is formed, together with a certain amount of water. Now, throughout all these complex transformations there are corresponding affinities which, for reasons already alleged, are accidents, yet directly and immediately concur towards the generation of the new substance.

III. An *à priori* argument is derived from the nature and characteristics of the substantial form. A substantial form is essentially determined to the first act by which, in the instance of material substances, the integral composite is constituted in being. This is, so to say, its appointed work. It is true that it is likewise the source and principal cause of the second act; because every entity acts by virtue of its nature, and the substantial form determines the nature. But all real action is in the singular, while natural operation is, as it were, not individual but specific; as will be further explained in the next argument. Hence, it exceeds the limits of finite substance to be at once principal and proximate principiant of its own actions. Thus, for instance, the human soul in its own essence is the fountain of intellectual as of volitional operation; but in order to think a thought, it requires a thinking faculty which is its property and outside the essence. Again: The faculty of speech, which forms a part of human operation, is rooted in man's essential nature. Yet, for all that, a man cannot speak unless he is provided with the organs of speech; and such organs, together with the faculty itself, are accidents.

IV. The above argument is confirmed by another that is based on the indeterminateness of the activity rooted in the substantial form. The force of this will be best understood by an illustration. The natural operations of assimilation, growth, reproduction, have their origin in the substantial form of the plant; but what is there in the simple form itself to determine the one operation rather than the other? It has already done its chief work in determining the specific life of the substance it has constituted; but its latent generic energy cannot be self-determined to this rather than that particular kind of action. Wherefore, it needs faculty and organ of growth, faculty and organ of assimilation, faculty and organs of reproduction, in order that it may be proximately determined to its

particular operation. But, as has been shown already, these faculties and organs are accidents; for they form no part of the essential nature.

V. The fifth and last argument is derived from the grave inconveniences that would follow from the contrary opinion. For it has been already intimated,—and later on, the facts will occupy our special attention,—that, in many cases of substantial generation, the principal agent is physically remote from the Subject of change and from the substantial effect produced. Nay, sometimes the principal agent has even ceased to exist prior to the generation. Hence, either the accidents are in some way or other empowered to educe the substantial form and to produce thereby the new substance, or the change must be attributed to the immediate action of the First Cause. But this latter hypothesis is physically inadmissible in the normal constitution of nature; because right order, as recognized in the facts of experience, seems to postulate that physical effects should proceed from the action of second causes, unless the effect should happen to be of such a kind as is manifestly beyond the capacity of a finite cause,—as, for instance, the creation of a human soul.

Difficulty.

It is impossible that any accident or collection of accidents should proximately contribute to the eduction itself of the substantial form. Therefore, etc. The *Antecedent* is thus proved. Every Efficient Cause must be at least equal, in order and nobility of nature, to its effect. But an accident in order of nature is essentially inferior to a substantial form. Therefore, it can never become cause of such form. All that it can do is, to dispose the matter for the substantial change. This argument is thus confirmed. Between a cause and its effect there must be some proportion. We cannot think with the faculty of sight, or hear with the faculty of will; because there is a total absence of proportion. But between an accident and a substantial form there is no proportion; for the two belong to different Categories, and differ in the primary constitution of their being. Accident has an essential dependence on an entity other than itself, so that it cannot naturally exist save in another; while the substantial form, *as act of matter*, has a natural independence, in its essence and existence, of any other finite entity.

ANSWER. The *Antecedent* is denied. The *Major* of the proof must be distinguished: *Every* principal *Efficient Cause must be at least equal in order and nobility of nature to its effect*,—granted; *every* instrumental *Efficient Cause*,—subdistinguished: *Every instrumental Efficient Cause must be at least equal in order and nobility of nature to the effect* which it produces by its own independent virtue,—granted; *to the effect* which it helps to produce in virtue of the principal agent,—denied. The *Minor* is granted. The *Conclusion* is distinguished. *Therefore an accident can never become* principal *Efficient Cause of the eduction of a substantial form*,—granted; *can never become* instrumental *Efficient Cause*,—subdistinguished: By its own unaided virtue,—granted; in the virtue of the principal agent,—denied. As touching the confirmatory argument: The *Major* is granted. It cannot be denied that there must be some proportion between an Efficient Cause and its effect; though it is at the same time plain that, in the instance of an instrumental cause, the proportion need not be so pronounced as that which intervenes between a principal agent and its effect. The *Minor* is denied. It is true that a substantial form and an accident are in different Categories, and that the substantial form *as act of matter* exists by itself, while accident has an essential dependence on another. Accordingly, it is not here that we discover the proportion. But they are both forms, and forms of material substance. Again: Qualitative accidents have an active energy of their own, just as substantial forms have. Lastly: Substantial material forms (with one exception) are dependent on matter in their origin and their continued existence; as accident is dependent on the integral substance. But thus much of proportion suffices to allow of an accident becoming instrumental cause of substantial change.

PROPOSITION CCXLVII.

In every case wherein the accident is physically conjoined with the principal agent, the substantial form of such agent exercises its own proper Efficient Causality in the eduction of the substantial form out of the potentiality of the matter by immediate influx, in union with the instrumental cause, into the effect produced.

PROLEGOMENON.

The accidents which, together with the principal agent, contribute towards the eduction of the new form and the consequent

generation of bodily substance, range themselves (for the purposes of the question before us) into two classes, determined by their local relation to the principal cause. Some, at the time of causal action, are physically conjoined with, others are physically separated from, the substantial form which is principal cause. It will be necessary to consider each separately; and in the present Thesis we begin with the easier case,—viz. that, wherein there is physical conjunction between the principal and the instrumental cause, at the moment when the generation is effected. The burden of the present and the next Proposition is to evince that, in the generation of material substances, the substantial form does not operate by proxy,—giving a sort of license to its instrumental accidents, and then leaving to these the direct operation; but that it in some way or other, immediately as well as principally, contributes to the eduction of the new form.

The Proposition is proved by the following arguments:

I. The first argument is based on the extrinsic evidence in its favour. The doctrine here maintained is taught generally by the peripatetics and, in particular, by the Doctors of the School. As before, let St. Thomas stand for all. 'The active qualities in nature,' he writes, 'act in virtue of the substantial forms; and in consequence a natural agent produces that which is like itself, not only in quality but in specific nature[1].' In this short passage four explicit statements are made. (i.) Accidents operate towards the generation of material substance; (ii.) They operate as instruments, *in virtue of the substantial forms*; (iii.) For this reason the effect is not limited to a *quality*, but extends to the *specific nature*; (iv.) The natural agent by its substantial form *produces* the effect. But these assertions collectively are incompatible with the hypothesis, that the substantial form does not directly exercise causal influx into the production of the effect. Take another passage: 'A body acts towards the production both of an accidental, and of a substantial form. For an active quality,—heat, for instance,—though it be an accident, acts nevertheless in virtue of the substantial form as instrument of the latter, and on this account can operate towards the production of a substantial form;

[1] 'Qualitates activae in natura agunt in virtute formarum substantialium; et ideo agens naturale non solum producit sibi simile secundum qualitatem, sed secundum speciem.' 1ae xlv, 8, 2m.

just as natural heat, forasmuch as it is an instrument of the soul, operates towards the generation of flesh. But it operates towards the production of an accident by its own virtue[1].' In this passage St. Thomas attributes to the qualitative accidents a real causality even in the eduction of the substantial form, and a causality moreover similar to the causality which they exercise in the production of accidents like themselves; with this exception, however, that in the former case their causality is instrumental, (i. e. the principal agent acts in and with them), while in the latter case they are as if principal agents acting of themselves and by their own virtue. Finally: The same Doctor expresses himself to the same effect in the following pregnant sentence: 'The action of an accidental form depends upon the action of the substantial form, in like manner as the being of accident depends upon the being of substance[2].' Now, an accident is simply an act of a complete substance. It is not so much a something in itself, as that by which substance is something. Its natural dependence on its substantial Subject is entire. Consequently, as the dependence of natural operation according to St. Thomas follows the dependence of the nature; the operation of an accident will not be its own so much as the operation of the substantial form on which it depends.

II. The Proposition is proved from facts of experience. Let fire be applied to wet faggots. For a time the quality of heat in the fire operates in drying and heating the fuel. After a time the faggots catch light, and a substantial change takes place. Here, then, one may plainly see the previous dispositive action of the accident of heat, and the subsequent transformation by the eduction of the new form of fire out of the potentiality of the matter through the action of the applied fire. This is more than implied by the common expression, *catching fire*. The transformations of the caterpillar into first the pupa and then the butterfly are another instance in point. The substantial forms in both the provisional states seem

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[1] 'Corpus agit et ad formam accidentalem et ad formam substantialem. Qualitas enim activa, ut calor, etsi sit accidens, agit tamen in virtute formae substantialis sicut ejus instrumentum; et ideo potest agere ad formam substantialem, sicut et calor naturalis, inquantum est instrumentum animae, agit ad generationem carnis; ad accidens vero agit propria virtute.' $1^{a e}$ cxv, 1, 5^{m}.

[2] 'Ita actio formae accidentalis dependet ab actione formae substantialis, sicut *esse* accidentis dependet ab *esse* substantiae.' $3^{r e}$ lxxvii, 3, 2^{m}.

directly to act through the accidental changes, so as to prepare the way for their successor. Yet again: In grafting, the scion is substantially transformed by the form of the stock in which it is inserted, yet retains its former properties in such wise as to give the same kind of flower to that which it had on the tree from which it had been cut. This is a striking instance; as the accidents seem to serve rather as an impediment.

III. An *à priori* argument is derived from the insufficiency of accidents by themselves for the work of substantial generation. An inferior form is insufficient of itself for the production of a form that is of an order nobler than itself. But an accidental form is inferior to a substantial form, which is of a nobler order. Therefore, it is insufficient, without the help of the principal agent, for the eduction of a substantial form.

IV. It derogates from the due perfection of a substantial form, to deprive it of such immediate causality in the eduction of the new form. For if an accidental form has the faculty of generating an entity in the same order of being with itself; it is putting the substantial form at a notable disadvantage, to deny to it a like capacity. Further: Such an opinion would strip the substantial form of all activity whatsoever. It does not contribute to the production of accidental forms. The opinion in question would exclude it from the production of substantial forms. Consequently, it would be wholly inert. Neither will it satisfy the difficulty to urge, that the virtue of the accident and therefore its causal action are derived remotely and fundamentally from the substantial form; because this explanation would make of the substantial form at the most a cause by accident and extrinsic to the action. Moreover: It appears impossible to explain on such a hypothesis the generation of living things according to their specific orders by hereditary descent; neither would it be possible to deduce from the operations of substances the nature of their essence.

V. It belongs to the perfection of the creature and to the Power and Wisdom of the Creator, that created things should be endowed, as secondary causes, with a power of communicating themselves in consonance with their nature; provided that there is nothing repugnant in the possession of such Causal Efficiency. But it is impossible to show that there is any repugnance either on the part of the form that is educed or on the part of the form that educes.

Therefore, etc. The *Minor* is thus declared. There is no repugnance, so far as the educed form is concerned; because itself is finite and evolved after a finite manner or, in other words, by no creative action. There is no repugnance on the part of the energizing form; since this latter is of equal perfection and of the same specific order with the effect.

DIFFICULTIES.

I. The substantial form is not itself immediately active, but only by the medium of its accidental faculty. So much was conceded in the last Proposition. Therefore, it must introduce the new substantial form by means of an accident.

ANSWER. The conclusion might be simply granted; for there is nothing in it which, if rightly understood, is not in strict harmony with the tenor of the present Proposition. But, in order to avoid all occasion of ambiguity, it may be well to point out an otherwise obvious distinction. The word, *immediate*, in its relation to the present problem is susceptible of a twofold meaning. It may either apply to the causal action *entitatively*, or as considered in itself absolutely; and then it would be equivalent to *without aid or intervention of a concomitant instrumental cause.* Or it may apply to the same causal action *terminatively*, or relatively to the effect; in which case it would signify *that which itself reaches the effect, not vicariously.* Now, the causality of a substantial form is not immediate in the former sense; while it is immediate in the latter. With the aid of this distinction the answer to the difficulty is plain.

II. The action by which the substantial form is educed out of the potentiality of the matter, is not distinct from the alterative action that disposes the matter for the information of the form. But the latter is due to the accidents. Therefore, the generative action is due to the accidents.

THE ANSWER to this difficulty will be made plain by the next Proposition.

III. The generative action, like all causal action properly so called, takes place between contraries. Consequently, that alone can be a proper principiant of such action, which admits of contraries. But substantial forms, as being in the Category of Substance, do not admit of contraries. Therefore, the qualities must be the proper principiants of substantial generation; because, as Aristotle teaches, they admit of contraries. Hot, for instance,

is contrary to cold, hard to soft, wet to dry; but there is nothing contrary to the substantial form (say) of a horse or of a geranium.

Answer. In reply to this objection two observations must be made. (i). It is not true that causal action, properly so called, takes place only between contraries; for privative opposition is sufficient, especially in cases wherein the production is instantaneous, as occurs in the instance of substantial generation. In other words, it is enough that, by virtue of the causal action, the Subject of the effect should pass from non-possession to possession of the form,—from non-actuation (which in the given case is privation) to actuation. For instance: A stone is thrown. By virtue of the causal action the stone acquires a new position in space, (that which would be called in the language of the School a new *ubi*). But between position and position there is no absolute, though there may be relative contrariety. But the absolute opposition is merely privative; that is to say, the stone was previously destitute of the new position, and has now acquired it. Similarly: The matter was originally unprovided with a plant-form; now, by virtue of the generating agent it has acquired such a form. Therefore, between the two terms of motion there exists a privative opposition; since the causal action involves a transit from not-being to being. (ii). In the next place it is to be remarked, that in such changes there may be a formal contrariety included in the generative action, which is to be found in the new qualities produced in the Subject as dispositive of the substantial transformation; but this formal contrariety is based upon the privative opposition proper to the eduction of the new form. Hence, though the generating action begins with proper accidental contrariety, it does not end there; seeing that the essential opposition between its term *whence* and term *whither* is privative.

IV. If the substantial form causes the effect immediately, the action of the accidental form is superfluous. Therefore, etc.

Answer. The *Antecedent* is distinguished: *If the substantial form causes the effect immediately* in both the senses of the adverbial term as already explained,—granted; *if it causes the effect immediately* only in a terminative sense, but not as considered entitatively,—denied. The substantial form needs to be determined in its action by the causal action of the accident.

V. St. Thomas says, 'It is to the substantial form that the accidental form owes the very fact of its being a principiant of action; and, in consequence, the substantial form is the primary, but not the proximate principiant of action[1].' If, then,—as St. Thomas teaches,—the substantial form is not the proximate principiant of causal action; its causality cannot have an immediate influx into the effect.

Answer. The word, *proximate*, requires to be distinguished after a manner similar to the word, *immediately*, as above. It may either mean nearest as determining cause of the particular causality, or nearest relatively to the effect. But it is plain from the whole context, that the Angelic Doctor in the passage which has been cited uses the word in the former of the two senses; for the question discussed turns on the human soul and its faculties. But no one doubts that the human soul itself thinks and feels; though the determining principiants of thought and feeling are the correlative faculties.

PROPOSITION CCXLVIII.

Although the accidents are merely instrumental causes of the eduction of the substantial form and the consequent constitution of the new bodily substance; nevertheless, their physical conjunction with the principal agent is not a condition so imperative as to hinder the said accidents from exerting their whole activity in substantial generation, even though they should be disjoined or even at a distance from the substantial form.

This Proposition is proved from constant facts of experience.

There is not, indeed, a known instance in the sexual reproduction of living things, wherein the accidents which instrumentally cause the substantial transformation are not physically separate from the principal agent at the time of fecundation, and much more at the time of the completed generation of the new being. The truth of this assertion is evident with regard to dioecious plants; as has been shown already in the proof of the *two hundred and forty-sixth*

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[1] 'Hoc ipsum quod forma accidentalis est actionis principium, habet a forma substantiali; et ideo forma substantialis est primum actionis principium, sed non proximum.' 1^{ae} lxxvii, 1, 4^{m}.

Thesis. But in the case of monoecious plants, especially of those whose flowers are bisexual, the truth of the statement is not at first sight so apparent; for the stamina and pistil belong as organs to the same substantial form; and the fertilizing pollen falls from the former on to the latter, within the narrow limits of the same flower. Yet even here there is a perceptible interval, however small, during which the pollen is free from the anther, and is not yet in contact with the stigma. Further: An interval, sometimes of months even, occurs between the pollination and the fertilization, when the pollen has reached the embryo-sac. Once more: Between fertilization and the eduction of the plant-form a considerable time elapses, often many years. In the case of the seed of annuals preserved for sowing and in countless other instances, the parent-plant or parent-plants both have perished, before the generation of the new plant. The seed itself has been proximately disposed by the accidents for the future germination; inasmuch as the matter has been normally organized, and only awaits the requisite conditions. The instances in the reproduction of fish are still more striking. In the case of cold-blooded fish the ova are separated from the mother before fertilization; and the milt, having been discharged over these by the male fish, remains there to accomplish its fertilizing mission. The normal process with salmon is as follows. After the female has prepared her spawning bed, 'turning herself partly on her side, she discharges a portion of the ova; at the same instant the milt is ejected by the male. By the action of the stream the milt is brought into contact with the ova, which sink into the trench prepared for their reception. The female then resumes the process of excavating the gravel, and covers the impregnated ova with the mud and stones, which are loosened by the waving motion of her whole body, and brought down the stream. Thus, at intervals, the operation is carried on, till the whole of the ova is deposited[1].' The same fact is more clearly illustrated in the common method of artificial fertilization adopted by fish-breeders, who take the female fish and squeeze out the ova; while by a similar process the milt is obtained, and made to fall upon the former. Immediately after this operation both fish might be killed; yet this would not in the least interfere with the breeding.

[1] *The Salmon and its artificial propagation*, by Ramsbottom, pp. 33, 34.

Generally, as soon as the ova have been obtained, the female is put back into the stream and allowed to swim off. The same is done with the male fish. Consequently, it is plain that the accidents accomplish the fecundation, the eduction of the form, and the generation of the living substance, while wholly separate from the principal agent. A curious corroborative fact is mentioned in the pamphlet already quoted. During the spawning season for the salmon, trout and other fish lie in wait, and devour a vast number of the eggs. In the belly of one trout Mr. Ramsbottom [1] discovered as many as a thousand eggs. 'For the purpose of experiment,' he tells us, 'the writer deposited the ova extracted from the gullets of the trout in question, in two of the boxes adapted for artificial breeding, in the construction and arrangement of which he was then engaged. Curious to ascertain whether they might still be hatched, he placed the boxes by themselves, under the same conditions as those which contained ova in the ordinary way. A portion came to life, and specimens of the fish thus strangely rescued from destruction were sent to the Dublin exhibition.' In this case not only were the parents both absent at the time of fertilization, but some considerable time must have elapsed between the discharge of the ova by the female and their being brought into contact with the milt. Once more: As regards the evolution of the substantial form and the generation of the animal, the same may be said of all oviparous living things; since the hatching is not accomplished for weeks after the laying of the egg. During all this time the accidents are separated off from the souls of the parents, and their only apparent coadjutor in the process of generating is heat either vital or solar, both of which are accidents themselves.

The facts, then, are incontestible; and it is by them that the Proposition is proved. There remains, however, a most important metaphysical problem connected with these facts, which cannot be ignored. Allowing, as one is thus compelled to do, that the accidents, in instances such as have been just detailed, effect the evolution of the substantial form and the generation of the new living body in a state of physical isolation and separation from the principal agent: How is it to be explained, that the accidents so

[1] The author is indebted for all the facts concerning the breeding of salmon to Mr. Ramsbottom of Clitheroe, who is well known for his success and skill in the artificial propagation of salmon in Great Britain and her colonies.

circumstanced can of themselves operate an effect that is thoroughly disproportioned to their nature? Is it possible to reconcile these patent facts with the philosophical axiom, that the cause must virtually or eminently precontain its effect? It is here supposed,—the resolution of the question will find its place elsewhere,—that no Efficient Cause can act, save in a state of physical conjunction either mediate or immediate with the Subject of its action. If, then, the axiom just mentioned be true, and consequently the causality of the principal agent is naturally necessary for the eduction of these forms; one of two hypotheses must be true. Either the accidents that are seen to cause the generation act in some way or other by the immediate virtue of the substantial form of the principal agent, or such causality is supplied by the immediate agency of the First Cause; for there is no medium hypothesis possible or conceivable. Which is the more probable hypothesis? Each can claim on its side Doctors of great name and of deserved authority. In a question so difficult, that which has been urged in support of each opinion shall be briefly given. It may be owned at once, however, that to the author's mind the teaching of the Angelic Doctor, as summarized in the second Note subjoined to the *two hundred and forty-fifth* Proposition, affords a most valuable clue to the solution of the difficulty, more particularly when it is taken in connection with the recent discoveries in physical science.

i. To begin with the easier and more simple hypothesis,—the *Deus ex machina:* The argument in its favour may be thus stated. It is undeniable that, in the generation of living things, accidents are seen to exercise their causality independently of the principal agent,—that is to say, of the substantial form of the generator. But no accident has of itself sufficient virtue to generate substance; since it is above the capacity of its nature. Wherefore, since the principal agent is precluded by physical separation from co-operating with its normal instrument; there is no way out of the difficulty, unless by supposing that the First Cause supplies for the inactivity of the principal finite agent. Some principal agent there must be. Patent facts seem to exclude the action of the finite agent. Therefore, we must have recourse to the action of the Infinite. To this solution it is with reason objected,—and Suarez, who favours this opinion, urges this same objection in connection with another phase of the problem,—that in constant phenomena, which are evidently under a natural law, such an explana-

tion is unphilosophical: *Nec Deus intersit, nisi dignus vindice nodus Inciderit.*

ii. The other hypothesis is, that in the alleged cases the accidents somehow or other effect the generation of living substances in virtue of the substantial form of the generating agent. But how? The ordinary answer given to this question is as follows. It is maintained that the eduction of the substantial form from the potentiality of the matter is a *pure result* of the proximate disposition of the matter; and, as a consequence, that such eduction requires no fresh causality distinct from that by which the proximate dispositions are produced in the Subject of the substantial transformation. To put it in another way: If once the matter by the agency of the accidents has acquired an organization, incompatible with the continued existence of the preceding substantial form and connatural with the new one; the latter is *ipso facto* evolved without further action, and expels the preceding. The causal action, therefore, is one and the same,—that viz. by which the matter is proximately disposed for the eduction of the form, and by which at the same time the form is actually evolved. This last proposition receives a qualified support from Suarez who, although inimical to the present hypothesis, nevertheless makes the following admission: 'In these accidents, however their entity may be preserved in a state of separation from their proper substantial form, there remains the whole virtue of action connatural to them; because such virtue is not really distinct from their entity. Wherefore, if they should be applied in the fitting manner to a given Subject; they will exercise in relation to this latter the connatural action by which they dispose its matter for the form proportioned to them. But, together with this action, if it arrive at the requisite term, is in the nature of things conjoined an instrumental action by which the substantial form is educed; because such action cannot be naturally separated from the final disposition[1].' Against this explanation, however, of the hypothesis now under consideration, formidable difficulties have been urged. Suarez insists with no little show of reason, that the generating action—for an action somehow undoubtedly there is—cannot be the term of alteration, (that is to say, the accidental disposition of the Subject); and this for two reasons. It is impossible that an action should be the term of any motion; because it belongs to the intrinsic nature

[1] *Metaph. Disp.* xviii, *Sect.* 2, *n.* 27.

of an action, that itself should be a way or movement towards a term, and that it should be produced of itself, and not by means of another action. But this first argument does not seem to be of much account; for it presupposes that which is the point in dispute,—to wit, the distinctness of the generative action from the active disposition of the Subject. Moreover: In motion,—as in the case of the balls on a billiard-table,—it is possible that the term of a precedent motion may be a consequent motion communicated to another. But, in the second place, he makes use of an argument that is of the utmost cogency. It is impossible that the act of generation should be the term of alteration, or of accidental effects; because of the nobility of its order which is under no circumstances reducible to the latter. The one is accidental; the other substantial. Wherefore, alteration terminates in the genesis of a quality; while the generating act terminates in a substantial form. It is the primitive difficulty over again; and a most serious and vital one it is. In fact it must be owned that this objection would be insuperable, if it could certainly be proved that the accidents acted exclusively by their own native energy and not by a real physical deputation,—if, in other words, they should assume the function and prerogatives of a principal agent. If, however, we can legitimately, with any show of reason, assume that they physically energize with the virtue of the substantial form and as really its instruments; the elenchtic argument at once loses all its strength. But *how* can they do this, if they are physically disconnected with the principal agent; and if (as sometimes occurs) the principal agent has even ceased to exist, previously to the dispositive action of the accidents and to the eduction of the substantial form? Here is the kernel of the difficulty. Is it possible that St. Thomas can help us to master it? The following considerations are submitted with the greatest diffidence; but with the firm conviction that they will serve towards an enucleation of this knotty problem.

a. First of all, it is to be borne in mind that, in the generation of living bodies, the instrumental cause (which in relation to the principal agent is justly denominated an accident, since it forms no part of the essence of the said agent) is in itself absolutely a substance with its own substantial form; otherwise, as is sufficiently obvious, it could not in the order of nature be separated from the substantial entity that lays claim to it. This, then, is the point to which attention is especially invited. These so-called

accidents have a substantial form, though only provisional. So much receives confirmation from recent physical discoveries; for it has been now ascertained that the so-called spermatozoa are living cells which unite with the germ-cell, and after a time seem to disappear in a sort of fusion with the latter during the development of the embryo; though they are virtually present throughout the process of substantial change. Consequently, these likewise act primarily by their substantial form, instrumentally by means of their proper accidents. But whence their form?

b. Since they are originally accidents of the principal agent, it would appear to be undeniable that they receive their own form in some way or other from the substantial form of the latter, when liberated from the living body to which they originally belonged. Previous to separation we must suppose that this form was only virtual; but it is educed by the agent in the very act of expulsion. By virtue of the primitive dependence of these instruments on the paternal form, they are charged with the *vital spirits*—to borrow the nomenclature of St. Thomas—that are diffused through the body and its official secretions. These vital spirits they retain, at the least for a considerable time, and with their aid accomplish the work of fertilization. This in like manner is strikingly confirmed by modern discoveries; for it has been found that these spermatozoa, or sperm-cells, are endued with remarkably active and spontaneous motion which they retain for some time after isolation from their source, even when not employed in the task of fertilizing, which may indefinitely prolong this vitality by conjunction with the life in the germ-cell. But if we hold,—in agreement with the teaching of the Angelic Doctor,—that the evolution of the final form and the consequent generation of the animal are effected only at a considerable interval of time after fecundation, (an opinion which recent discoveries in embryology tend strongly to confirm); it seems highly improbable that these substantial accidents should cause the said effects, since to all appearance they have long ceased formally to exist. Wherefore,

c. We must recall to mind the teaching of St. Thomas, that in all generations of all living things, more particularly of the higher orders of animals, the process is a gradual one;—that is to say, a series of provisional forms is successively generated, till the work is finally accomplished by the eventual eduction of the form that was from the first intended by nature. Accordingly, the

original instrumental causes do not disappear, till they have caused the evolution of the first and lowest provisional form in the series. This in turn yields to the evolution of a higher form; and so on, till the allotted series is completed. Such an explanation, however, though satisfactory up to a certain point, yet gives rise to that which looks like an invincible difficulty; for it seems to postulate, that each form in the series should have the capacity of evolving a form higher and nobler than itself,—a supposition that is contrary alike to reason and experience. Wherefore,

d. We must finally turn back to a division of instrumental causes, signalized by the Angelic Doctor, which will be found under the tenth Number of the second Note subjoined to the *two hundred and forty-fifth* Proposition. It will be there seen that, while some instrumental causes do not receive the impress of any form from the principal agent, there are others which do receive such impress. We can observe something analogous to this in artificial instruments. Thus, for instance, a chisel or a gimlet receives no form productive of motion from the artisan who has fashioned it; so that it can only produce its effect by submitting to the imparted motion and direction of the carpenter who is using it. But a stone-cutting machine can go on with its work, when set to it, by virtue of a power given to it in the form of its construction; and a clock requires winding up only once a week. Both have received, from the mechanist who fabricated them, the impress of a sort of form, by virtue of which they can work on their own account according to the intention of him whom, in pursuance of the analogy, we may call the principal agent. It is thus that, in the order of nature, the accidents instrumental in living generation receive a sort of delegated autonomy in their causal action. But after what manner is this hypothesis to be explained? It must not be forgotten that—as has been shown in a previous Chapter—those of the qualities, belonging to the old substance, which are compatible with the newly educed form, remain essentially the same throughout the substantial transformation, though receiving a new existence with the generation of the new substance. The form, then, of the instrumental cause, by virtue of its procession from the principal agent,—the substantial form of the parent,—is endowed with properties which continue in their essential nature throughout the successive substantial changes up to the ultimate development, and gradually

organize the matter for higher and higher forms of life. They have no sooner produced by their action a more perfect organism, than the matter grows impatient of the lower form; and the form next in order is educed by the virtue originally impressed on the instrumental cause. These qualitative accidents are above the exigency of any one of the provisional forms, and work on under each towards the attainment of the ultimate and perfect substance. The forms themselves, with the exception of the last, are so many stepping-stones in the progressive development; and successively receive and transfer the impress primitively received in the first. They may be considered, therefore, as so many instrumental causes towards the complete generation intended by nature.

e. But here occurs a final difficulty, which both Scotus and Suarez have urged with great force. On the one hand, the principal agent—as being separated from its instrumental cause as well as from the Subject of the effect—does not operate directly: On the other hand, the instrumental cause is no longer existing; because, according to the more received teaching of the School, the substantial form immediately actuates primordial matter, and brings all its accidents along with it in its train. Consequently, there is no physical cause whatsoever capable of the generating action. Is there not here an unintentional confusion between *action* and *act*? The act is term of the action; and the former is in an instant, while the latter may be in time. Hence, there is no possible interval between the two; for, even if the action is in an instant, it is in the same instant with the act. Wherefore, two things: There is no interval between the desition of the one form and the introduction of the other; secondly, there is no possible interval between the existence of the persistent qualities under the old substance and the renewed existence of the same under the new. Hence it follows, that the said qualities are existentially present throughout the action up to the act itself of complete generation; and are accordingly competent, in conjunction with the actual temporary form, to educe the new one. Against this it may be urged, that the explanation does not meet the objection, for the reason that follows: It contemplates the qualities existent in the Subject of generation, the transformed substance itself; not the qualities in the instrumental cause which has disappeared with its accidents long ago. But it is precisely these latter, and these alone, that are taken into account in the

question of Efficient Causality, not the former. Hence, the explanation offered eludes the knot of the difficulty. For answer, it must be owned that this objection would hold good, if it were question of the simple eduction of a substantial form and of the direct generation of a living body intended by nature as its ultimate; but it has no force in presence of provisional forms and provisional substances in series, where there is a process of gradual development. With the exception of the last completorial form, all the rest collectively may be considered as an instrumental cause in the production of the new substance, by virtue of the impress, or virtue, primitively communicated to the first form by the principal agent and passed on from form to form. Nor is there in this any inconvenience; because, as provisional forms, they transmit the generative motion which they have received. Thus these intermediate forms are at once effects and causes; effects of the preceding, causes of the subsequent.

COROLLARY.

If we adopt the second opinion,—as modified, or rather interpreted, according to the tenor of the above explanation,—the answer to the second difficulty under the preceding Proposition is obvious. The generative action is due to, what it may be allowed to call, the substantial accidents of the principal agent, as is there concluded; yet not in the mere virtue of their own nature, but by virtue of a sort of form impressed on them by the principal agent on behalf of which they act. But the action is not exclusively accidental; since it is always under the direction of some provisional form.

PROPOSITION CCXLIX.

Although in the natural order it would seem that the accidents, as instrumental causes of substantial generation, invariably act in virtue of a form impressed upon them by the principal agent; nevertheless, should there be proved to be any instance wherein the accidents generate a new substance without any whatsoever influx of the principal agent, it would be necessary that the requisite influx of the substantial form should be supplied by the Co-operation of the First Cause.

All proof of this Proposition would be superfluous; since it is a simple corollary from the doctrine established in the preceding Theses.

APPENDIX.

HERE, at the end of the present Section, will be the most appropriate place to consider the teaching of the Angelic Doctor touching the Efficient Causes of the generation of living bodies in its bearings on modern physical discoveries. For that which concerns the production of inorganic compounds, the reader is referred to Appendix A at the end of the last Volume.

NOTE I.

It seems hardly necessary to caution the reader against the error of supposing, that this and the following Notes purport to claim for the teaching of St. Thomas and of the School in general anything like an identity with that of modern Physics. No one who is at all competent to judge the question, would be mad enough to essay such a task. It is well known that, in those days, not only was the number of the elements estimated otherwise than it is at present; but that some were accounted elements, which are known to be compounds now, while others were deemed to be compounds then, which are reckoned as simples now. Thus, water was one of the elements of the ancients; and gold was esteemed by them to be a compound of mercury and sulphur. They erred likewise touching the constitution of particular compounds. For instance, they believed common salt to be composed of fire and water; whereas it is now understood to consist of a combination of sodium and chlorine. But these matters belong exclusively to the domain of physics; and when the metaphysician has occasion to treat of them in their general relations to being and causality, he must accept his facts from the physicist of his day. The one object, then, of these notes is, to show that the Scholastic teaching, in regard of the constitution of bodies and their active production, is in harmony with the most advanced physical discoveries of our time; and that the principles

of the former,—always excepting particular applications,—coincide with such of the acknowledged laws of the latter as have been established by the certain witness of observation and experiment. With this intent, let us now return for a while to those fundamental principles touching the constitution of inorganic bodies, which have been gathered from the teaching of the Angelic Doctor, and are to be found in the Appendix just mentioned. We will include in the general survey those wider metaphysical principles that have been developed in preceding Chapters.

i. The whole of the material sublunary universe has been evolved out of certain elements, or simple bodies. A simple body is the ultimate in actual physical analysis: It is not reducible, by any means at present known, to simpler constituents. Try in imagination to do so; you are out of the range of physics, and stand face to face with primordial matter. What says the modern chemist? 'Various substances,' writes Dr. Miller, 'may easily be shown to contain more than one kind of matter' (the term *matter* is here used in its common or unphilosophical acceptation); 'while others have hitherto foiled all the efforts made to separate from them any second substance. For example, from a mass of pure silver nothing can be obtained but silver itself, copper will furnish nothing but copper, and from sulphur the chemist can extract nothing but sulphur. Such bodies have therefore been called *undecomposed* or *simple substances*, or *chemical elements*. . . . Every material object with which we are acquainted is, in a chemical point of view, either an element or a compound, or else a mechanical mixture of two or more elements or compounds[1].' Of course, Dr. Miller means, 'every material *substantial* object.'

ii. Out of these simple bodies a certain composition may be made either by mechanical mixture or by chemical action and combination. In the former case, each of the substances so mixed perseveres in its own distinct integral nature; in the latter case, the two or more substances so combine that, from their union, there arises a new substance, known by its own peculiar properties, in the place of the original components. Again: What says the modern chemist? The same authority shall supply us with an answer: 'Mechanical *mixture*, then, and chemical *combination* are two very different things. . . . In the case of every true chemical compound,

[1] *Introduction to the study of Inorganic Chemistry, ch.* i, *pp.* 2, 3, *A.D.* 1879.

not only are the proportions of its constituent elements fixed, but the properties of the compound, for the most part, differ totally from those of the separate elements which form it, as well as from those of the mixture of the two elements before they have become chemically united[1];'—plainly connoting a difference of essential nature. On the other hand, speaking of a mechanical mixture of salt and sugar by way of illustration, the same writer remarks: 'Each particle of salt and of sugar, however small, still continues a true chemical compound unaffected by the other[2].'

iii. For adequate chemical combination, it is necessary that there should be a due proportion between the components. 'Whilst in every true chemical compound,' writes Dr. Miller, 'the proportion of its constituents is perfectly fixed, in a mechanical mixture the proportions of the substances of which it is made may be altered to any extent that may be desired[3].' In fact, one of the accepted laws of chemical combination is the law of definite proportions, which is embodied in every chemical symbol. By this law is meant, not that bodies only combine when brought together in due proportion; but that they enter into combination, *as constituents of the compound*, according to a fixed proportion; so that any surplusage on either side would not enter into the composition. This is intended to be conveyed by the term, *adequately*, in the first sentence of the present Number.

iv. A diversity in the relative proportion of the constituents, where the proportion connotes a possible combination, causes a specific diversity of compound. This principle is virtually included in the law of multiple proportions which, while admitting the fact, further declares that these proportions must vary according to the terms of a simple series of multiples. Both may be illustrated by the following example. Take five different combinations of nitrogen and oxygen,—two elements which, in mechanical mixture, all but entirely constitute the common air we breathe. These combinations are severally represented by the following symbols: NO, N_2O, NO_2, N_2O_3, and N_2O_5. The first (NO) is nitric oxide, a colourless and transparent gas, with a strong disagreeable smell,

[1] *Introduction to the Study of Inorganic Chemistry, pp.* 14, 15.

[2] *Ibid. p.* 15.

[3] *Ibid. pp.* 14, 15. This is true of solids and gases; but there is a limit in the case of solutions.

suffocating when inhaled, distinguished by its strong affinity for oxygen. The second (N_2O) is nitrous oxide, commonly known as laughing gas. It is colourless; but has a faint, sweetish smell and taste. When inhaled in mixture with air, it produces laughter; inhaled pure, it is a powerful anesthetic. The third (NO_2) is nitrogen peroxide, of a deep red colour, and very unstable. The fourth (N_2O_3) is nitrous anhydride, a deep red gas, distinguished by its producing an acid in union with water as well as by its producing a series of salts called *nitrites*. The fifth (N_2O_5) is nitric anhydride, a solid crystalline substance. Here we have five different substances, each with its distinctive properties; yet all the five are exclusively composed of the same two elements, differing only in their relative proportions. Here, again, the modern chemists and St. Thomas are at one.

v. It is a property of chemical combination, that there should be a balancing or mutual adaptation (that which the Angelic Doctor terms *temperamentum commixtionis*) of the several components in the compound. This property, assigned by the School, finds expression in the law of equivalent proportions, which modern chemistry formulates as follows: 'The amount of each element which is capable of displacing any of the other elements must be in the proportion of the weight of the displacing element, or of a simple multiple of that weight[1].' To explain and illustrate this law: There are *atoms*, (the modern chemical terminology is here adopted for a sufficiently plain reason), which have only what has been called one *bond*,—as those of chlorine,—and are called monads; others have two, three, four, etc., and are respectively known as dyads, triads, tetrads, etc. Consequently, since hydrogen (because it has the smallest combining weight) is assumed as the unit, or standard of comparison; a monad *atom* combines with one *atom* of hydrogen or an equivalent,—for instance, H Cl, hydrochloric acid, whose *molecule* is composed of an *atom* of hydrogen and an *atom* of chlorine. A dyad requires two *atoms* of hydrogen or an equivalent, —as H_2O, water, whose *molecule* is composed of two *atoms* of hydrogen and one of oxygen. A triad requires *three* atoms of hydrogen or an equivalent,—as NH_3, ammonia, whose *molecule* is composed of three *atoms* of hydrogen and one of nitrogen. A tetrad, after a similar manner, requires four *atoms* of hydrogen or

[1] *Introduction to the Study of Inorganic Chemistry, ch.* x, *n.* 42, *p.* 192.

an equivalent, as CH_4, marsh gas, whose *molecule* is composed of four *atoms* of hydrogen and one of carbon. It is the same with pentads, etc. That which holds good in the instance of binary compounds, is equally verified in the most complex compound substances. The so-called bonds of each *atom* of each element that enters into the combination must be fully satisfied, as a necessary condition of the constitution of the *molecule*. Can anything more clearly illustrate the *temperamentum commixtionis* of the Angelic Doctor than the above chemical facts?

vi. St. Thomas likewise makes mention of a well-balanced interlacing, so to speak, of the constituents,—or, as he expresses it in Latin, *aequalitatem complexionis*. Now, it may be said that this requirement is abundantly confirmed by the law and facts detailed in the previous Number. But, if we are to understand that there is any difference at all between the two phrases, *temperamentum commixtionis* and *aequalitatem complexionis*, (which is far more probable, having regard to the severe precision habitual to the Angelic Doctor); it seems only natural to refer the latter to the peculiar disposition among themselves of the integrating parts of a given substance, whether element or compound. So understood, the doctrine conveyed by the term in question is signally confirmed, first of all, by the phenomena of *metameric* bodies, as they have been called. Metameric bodies (which have been only found in organic compounds) are those, the composition and atomic weight of which are identical; while, notwithstanding, they exhibit a marked difference of properties, and connote thereby a difference of substantial form and of specific nature. Thus, for instance, ammonic cyanite, $(NH_4)O(CN)$, and urea, N_2H_4CO, have precisely the same elemental constituents and the same number of *atoms* for each element. Both *molecules*—to borrow again from the vocabulary of modern chemistry—contain two *atoms* of nitrogen, four of hydrogen, one of carbon, and one of oxygen; as may be perceived from their respective symbols. Yet ammonic cyanite is very unstable; while urea is quite the reverse. The difference, then, between these two organic substances must necessarily be attributed to a variety in what St. Thomas calls the *well-balanced interlacing* of the constituents with their active and passive qualities, or—as modern chemists prefer to represent it—to a new disposition of the constituent *atoms*, as it is in fact represented in the two symbols. Take another instance from the facts

of common life: In bread there is starch. You toast a slice of it, and on the browned surfaces the starch, by the action of the heat, is changed in its qualities and becomes dextrine, so called from its property of turning the plane of the polarization of light to the right hand; though the *atomic* proportion in both substances is precisely the same. Chemists tell us that the change is due to a re-arrangement of the *atoms* in the *molecule*.

In the second place, a phenomenon, observable in the simple bodies themselves, serves to illustrate this principle of what St. Thomas calls *interlacing*,—the more so, that chemists attribute it to a change in the disposition of the constituent atoms. The phenomenon referred to is that of *allotropy*. It is thus explained by Dr. Miller: 'Many of the elements have the power of assuming forms which differ in appearance and properties quite as much as these three different conditions of carbon,'—that is to say, diamond, plumbago or graphite, and charcoal,—'such elements are then said to assume different *allotropic* states, which is as much as to say that in each different modification, though the atoms are all alike, yet they are arranged in a different way. The atoms of carbon, for instance, which constitute diamond, are arranged very differently from those which form graphite, and the atoms of carbon in charcoal are differently arranged from those of either diamond or graphite[1].' Three substances can hardly be imagined more distinct than the transparent, refractive diamond, the black-lead of our pencils (whence the name graphite), and charcoal. To take another instance: Ozone is said by the chemists to be an allotropic form of oxygen; and it has distinct properties of its own. The hypothesis has been put forward, that these two bodies differ in the number of *atoms* which respectively go to form a molecule of each. In like manner, there are four allotropic forms of sulphur, each with distinct properties; three of phosphorus, with equally distinct properties. Now,—considering these phenomena from a purely physical point of view, viz. taking these diverse substances as already constituted in their nature,—there seems to be no intelligible way of explaining these specific differences in the same simple body, (as we are told it is), save by understanding a variety in the interlacing of the parts. If it should be further demanded: How has this variety been brought to pass? we are at once extrava-

[1] *Introduction to the Study of Inorganic Chemistry, ch.* iv, *n.* 18, *pp.* 92, 83.

gating beyond the domain of physics. The metaphysician would be inclined to answer,—though it may be open to some doubt,—that these bodies are distinct substances, having each a distinct substantial form; and that the variety in the interlacing (so to say) of the quantitative parts, is due to the difference of substantial form. It must be owned that it is difficult to arrive at any other conclusion; unless one is prepared to deny, that from a difference of properties can be legitimately inferred a specific difference of nature.

vii. St. Thomas further teaches, that there are in the simple bodies (not, of course, to the exclusion of other bodies) two kinds of qualities,—to wit, such as are active and such as are passive. It is hardly probable that any chemist, whatever may be the metaphysical theory touching the constitution of material substance that he has adopted, will be inclined to quarrel with this statement. Even the pure dynamist admits in the central point of his force a *vis inertiae*, which is simply receptive of action from without. Moreover, it is plain that there is a marked difference between moist, dry, hard, soft, on the one hand, and heat or electricity or light, on the other. For, while it cannot be denied that the former do act on other bodies, and that the latter, as latent in their Subject, are capable of being acted upon from without; it is nevertheless true that, taking their respective natures on the whole, the former are markedly passive and the latter markedly active. Even in the instance of hard and soft, if we exclusively consider these accidents in their mutual relation, hard is the active and soft the passive quality; as, indeed, St. Thomas has represented the two. In like manner, the metaphysical axiom,—that action and passion are correlatives and, consequently, postulate mutually the existence of the other,—is so patent to common sense, that its simple expression carries with it its own proof. How, for instance, could A attract B, unless B had the passive capacity of being attracted? How could a body by its refractive power produce, through the medium of certain rays of light, a sensile impression in the soul of an animal, unless this soul should have a faculty of sight passively receptive of such act? It follows, then, that as an element has active qualities, so must it likewise have passive qualities; otherwise, chemical combination would be impossible. Indeed, the active qualities in such case could hardly exist; since they postulate their correlatives as a normal condition of their

existence. Here it is that we seem to perceive an obumbration of that sexual differentiation which, becoming step by step more apparent through the ascending gradations of vegetable life, finds its perfect development in the highest orders of animal life.

viii. St. Thomas teaches, moreover, that in chemical combinations the qualities of the combining elements are so far neutralized by their interaction as to produce a medium quality,—that is to say, a quality proper to the compound and distinct from that of each constituent, though virtually containing them all. This law is clearly illustrated by what chemists teach us concerning the constitution of salts. A salt is the result of the chemical action of an acid on a base. An acid in the greater number of cases is a combination of a metalloid, or non-metallic element, with oxygen and hydrogen; a base in most cases is the combination of a metal with oxygen or with oxygen and hydrogen. Dr. Miller shall supply us with the facts in his own words: 'Many elementary substances, like sulphur and phosphorus, by their combination with oxygen, furnish compounds which are freely soluble in water, and have a sour, and often a burning taste; they also turn many vegetable blue colours . . to a bright red. Such oxides are called *anhydrides* (which means bodies free from hydrogen), to distinguish them from the bodies these same oxides furnish when they are acted upon by water, which all contain hydrogen, and belong to the class of *acids*. Many of the metals, on the other hand, by their union with oxygen, give rise to bodies of an opposite kind, which have been termed *bases*. For instance, the white alkaline substance formed by burning potassium in oxygen is dissolved rapidly by water; it produces a colourless liquid, of a soapy, disagreeable taste, and a peculiar lixivial[1] smell. It corrodes the skin, dissolves oil-paint, restores the blue colour to litmus[2] which has been reddened by an acid, and *neutralizes* the strongest acids. This power which acids and bases have of reacting upon each other and of destroying the chemical activity which each has when separate, is the most marked feature of these two classes of substances. The compounds produced by their action upon each other constitute what are called *salts*, and, when freed from

[1] That is to say, a smell similar to *lye*, (*lixivia*), which is 'water impregnated with alkaline salt imbibed from the ashes of wood.'

[2] 'A purple or blue colouring matter, prepared from certain species of lichen.'

the water in which they are dissolved, may often be obtained in crystals[1].' No comment on the teaching of the Angelic Doctor touching this point could well be more complete;—the more so, seeing that the concordance is so entirely unconscious.

ix. St. Thomas adds another canon to his digest of doctrine touching the constitution of inorganic compounds, which merits serious consideration. He remarks that, though the substantial form of the constituent elements does not remain *actually* in the compound, nevertheless,—unlike other forms,—it remains *virtually*, by reason of the virtual persistence of its properties. Now, in declaring this, it is obvious that he means much more than such a virtual inclusion of the form in the potentiality of the matter as is common to all bodily forms. For he signalizes an actual disposition of the matter for the particular form or forms, similar to that which exists when the matter is proximately disposed by the accidents for the evolution of its new form. To distinguish this state of the form of the element in the compound from that of other forms in the potentiality of the matter, one might roughly say that these elemental forms exist half actually (so to speak) in the Subject; since they virtually energize in the compound by their qualities. In harmony with this explanation the Angelic Doctor tells us, that 'a simple body, though corruptible in part, is incorruptible as a whole,' and that 'simple bodies after a certain sort exist in the compound *potentially*[2],' i.e. by an *active* potentiality; while in another place he adds: 'The elements, then, do not remain actually in the compound, like *body* and *white*; neither are they—either both or one of the two—corrupted or altered; since their virtue is preserved[3].' Consequently, he flatly denies that, in the generation of the compound, the elements are physically stripped of everything but their primordial matter; and he evidently considers them as the veritable material out of which the earthly universe has been evolved. Now, this view is in complete harmony with the facts of inorganic and organic

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[1] *Introduction to the Study of Inorganic Chemistry*, *ch.* ii, *n.* 11, *pp.* 31, 32.

[2] 'Et ideo corpus simplex, etsi sit corruptibile secundum partem, est tamen incorruptibile secundum totum. In mixto sunt corpora simplicia quodammodo in potentia.' 4 *d.* xlvii, *Q.* 2, *a.* 1, *q.* 1, 3^{m}.

[3] 'Non igitur manent elementa in mixto actu, ut corpus et album; nec corrumpuntur nec alterantur ambo nec alterum; salvatur enim virtus eorum.' *Opusc.* xxxiii (*aliter* xxix), *fi.*

chemistry. We know, for instance, that in binary and other compounds it only needs the action of a force or virtue, like that of heat or electricity, to disturb the equilibrium of the compound and resolve the latter into its constituent elements. But, unless the elemental forms were latent in the compound after a manner altogether different from other forms, there is no sufficient reason why they should reappear on the decomposition of the compound; since in such case there is nothing to account for primordial matter being determined to these rather than to any other material forms. Take another opposite instance by way of illustration. Metaphysically speaking, the forms of meat and of bread cease to exist in the human body after their incorporation by process of assimilation; but, unlike the elemental forms, they cannot be made to reappear by any chemical process. Why is this? Because in their case a substantial change had taken place, prior to their assimilation. Bread had once been subject to a vegetative, the meat to an animal form. On the other hand, what an important part the easy resolution of an oxygenous compound is known to play in vegetative life! All these facts, and others like them, seem to show most convincingly, that the elemental forms remain in the compounds after a manner quite different from all other forms.

x. St. Thomas adds yet another observation with respect to chemical compounds. He says that the complex interlacing and delicacy of balance of the proportioned elements in a compound body, are more perfect in proportion to the perfection of the substantial form. Does this statement harmonize with the facts of chemistry? Exactly, as it would seem. It may be asserted that, as a rule, the composition of organic bodies is much more complex and more delicately balanced than that of inorganic substances. Chemists tell us, that often the *molecule* of an organic body consists of hundreds of *atoms*, as will be seen directly. It is this, in fact, which is cause in great measure of their instability. Take, as an instance,—albumen, which is the principal constituent of an egg, is most abundant in the human body, and exists nearly pure in the serum of the blood. It is so complex a compound, that till lately its constituents could not be accurately given; and contains carbon, hydrogen, nitrogen, oxygen, sulphur, etc. Fibrine, which enters largely into the composition of our bodies, is so like albumen that chemically it is scarcely distinguishable from this

latter, save (as some say) by a slight excess of oxygen. It is this very complexity in the constitution of organic substances, which Liebig assigns as cause of their easy decomposability. 'It is evident,' he writes, 'that impulses of motion, certain causes tending to disturb the force of affinity, which exercise no decomposing influence upon more simply constituted atoms' (molecules), '—as, for instance, that of inorganic substances—may, nevertheless, be capable of producing alterations in organic atoms' (molecules), 'that is, in all atoms of a higher order. It is upon the greater complexity of composition of organic bodies, together with the lesser force with which, consequently, their constituent atoms attract each other, that their easier decomposability depends; heat, for instance, disturbs their composition with much greater facility than it does those of inorganic bodies[1].' Neither is this instability of organic compounds exclusively attributable to the complexity of heterogeneous constituents, but likewise to the large proportion of each constituent required for the composition. 'It is a general rule,' Dr. Kirkes tells us, 'that the greater the number of equivalents or atoms of an element that enter into the formation of an atom of a compound, the less is the stability of that compound.' To this, as one of the principal causes, he ascribes 'the great proneness to decomposition[2]' of organic compounds. Liebig illustrates this acknowledged truth by comparing two inorganic with two organic bodies. 'A particle of common salt,' he writes, 'or of cinnabar (vermilion), presents a group of not more than two atoms, while an atom' (molecule) 'of sugar contains thirty-six elementary atoms, and the smallest particle of olive-oil consists of several hundred simple atoms[3].' Indeed, olive-oil, as we are told, is a mixture of several compounds; and the sum of the *atoms* forming the *molecule* of each constituent would probably amount to hundreds. These facts surely offer a strong confirmation of the *dictum* of St. Thomas.

xi. It seems plainly enough to be the teaching of the Angelic Doctor, that the Efficient Cause of these chemical combinations are the substantial forms of the combining elements with their active and passive qualities,—the active, functioning as instruments of the substantial form, the latter receptive of the action or effect.

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[1] *Letters on Chemistry, Letter* xix, *p.* 174, *Third Ed.* 1851.
[2] *Handbook of Physiology, ch.* 1.
[3] *Letters on Chemistry, Letter* xix, *p.* 173.

From this mutual action and submission to action on the part of each component element, results that interaction by which chemical combination is effected. According to the same teaching, there are certain seminal virtues—shall we call them forces?—in bodies, (called *seminal*, because they have been sown broadcast throughout the field of nature), which dispose the matter of each element for a common transformation, and thus assist the agent-forms in the eduction of the new substantial form that is to replace themselves. But these virtues or forces may be said to act immediately upon the qualities, by whose mutual modification the matter is proximately disposed for the substantial change. On this point again, (if we except the terminology), the chemists are not likely to put in any disclaimer; since they attribute these combinations to the mutual affinities of the elements; and likewise tell us, as result of experiment and of a well-grounded induction, that these combinations take place only under the operation of light, or of heat, or of electricity, or of some other similar force.

xii. Thus far we have succeeded—as it is to be hoped—in showing, that there is a striking harmony between the teaching of St. Thomas and the facts and laws of modern chemistry. But there is, nevertheless, a serious objection which seems to stand in the way of these efforts at conciliation. A chemist may be disposed to expostulate in the following manner: 'Granting that on the whole there is the congruity which has been claimed in the previous Numbers, (and of this there can be little doubt entertained); what about the doctrine touching the substantial form and primordial matter? You begin with these; we begin with atoms and forces. We say that all bodies are the result of a combination of atoms, or rather of molecules constituted by these atoms. You say that all bodies are constituted of matter and form. How, then, can there be concord, where there is an outstanding quarrel from the very beginning? Again: We maintain that in chemical combinations each element remains in its own integral nature; so that in water, for instance, the atoms of oxygen are as completely oxygen after combination as they were before, and similarly the atoms of hydrogen. This is diametrically opposed to the Scholastic teaching, which asserts that the oxygen and hydrogen only remain virtually in the compound, and that a new substance is generated by the evolution of the substantial form of water. Lastly: The Doctors of the School unequivocally reject the atomic theory, which is

intimately interwoven with every portion of the science of chemistry as now taught; and the constant italicizing of the terms, *molecule* and *atom*, in previous Numbers, is no uncertain indication of your agreement on this point with the Scholastics.'

The above is undoubtedly a serious, if not invincible, difficulty. It will be well, however, to discuss it; that we may be able to see how far concession can go, and to determine also where precisely it is necessary to draw the line. But before doing so, there is one remark to be made. It was never contemplated to maintain in this Note, that the doctrine of the School could be made to square with any philosophical theory which leading modern chemists might be pleased to adopt. With all becoming respect it must be plainly maintained, that the metaphysical question touching the ultimate constituents of bodily substance is outside the limits of any physical science; and for a physicist, as such, to undertake the task, is a transgression against the harmonious order of the sciences. That which has been here attempted is, to exhibit the correspondence of the Scholastic or peripatetic metaphysics with the facts and laws set before us in modern chemistry. It is, moreover, only just to add, that (as has been already shown) not all the eminent chemists of our time are unanimous in yielding an undoubting assent to the atomic theory; while others are free to confess, that the certain truths of chemistry are not dependent on, or indissolubly connected with, the truth of that theory.

Thus much premised, let it be borne in mind that the practical adoption by chemists of the atomic theory may proceed from one or other of two motives. They may have adopted it provisionally, as best suited to their needs or as having been already selected for the purpose. Some have even declared as much. Or, again, they may have accepted it as, to their thinking, the only consistent interpreter of physical phenomena and as being substantially true. With the former of these two motives the metaphysician has little or nothing to do. It is not for him to judge, whether such an economy is or is not the most convenient for chemical symbolism. It may perhaps, however, be permitted to express astonishment, that atom and molecule—both of which (even if they exist) are out of the reach of possible sense-perception—should have been selected as units in a science which, like other physical disciplines, lays claim to be founded exclusively on the induction of experience.

But it behoves us carefully to examine the alternative hypothesis, —viz. that the atomic theory has been accepted as a true interpreter of chemical phenomena and of chemical laws, and as being the only true explanation of physical facts. Now, this hypothesis may be considered either from a physical, or from a metaphysical point of view.

a. If we regard it physically, thus much can be granted. It seems beyond all question that it is possible, by mechanical or conceivably mechanical agency, to reach an ultimate, which will at least justify the concept of the existence of a molecule. This statement is sustained by the authority of the Angelic Doctor. 'A natural body,' he writes, 'is not capable of infinite division, but only a mathematical body,'—that is to say, continuous quantity in the abstract; 'as is gathered, in the third Book of the *Physics*, from the words of the Philosopher and of the Commentator. . . . Now, that is called a natural body, which is considered according to some determinate species and efficiency; and this cannot be divided infinitely, because every species postulates a determinate quantity in regard of more and less,'—in other words, it cannot go beyond certain definite limits either in greatness or smallness of size; 'for, as is said in the second Book *De Anima*, a limit and measure of magnitude and growth is imposed on all natural composites. Wherefore, it is possible to arrive at the smallest quantity of water and the smallest quantity of flesh; so that, if you divide it, it will be no longer water and flesh[1].' Again, in another place he asserts that 'if we apply magnitude to a determinate nature, there is a certain smallest magnitude; because every nature postulates a determinate greatness and smallness[2].' Moreover, if we limit the term, *molecule*, to the physical ultimate in compound bodies, and reserve *atom* for the physical ultimate of

[1] 'Corpus enim naturale non est divisibile in infinitum, sed solum corpus mathematicum, ut ex 3 Physic. ex verbis Commentatoris et Philosophi habetur. . . . Corpus autem naturale dicitur quod consideratur secundum aliquam determinatam speciem et virtutem: et hoc non potest dividi in infinitum, quia quaelibet species determinatam quantitatem requirit et in plus et in minus: sicut enim dicitur in 2 de Anima, omnium natura constantium positus est terminus et ratio magnitudinis et augmenti: et ideo est invenire minimam aquam et minimam carnem, ut dicitur in 1 Physic., quae, si dividatur, non erit ulterius aqua et caro.' 2 *d.* xxx, *Q.* 2, *a.* 2, *c., med.*

[2] 'Licet applicando magnitudinem ad determinatam naturam, sit aliqua minima magnitudo: quia quaelibet natura requirit determinatam magnitudinem et parvitatem.' *Physic. L.* vi, *lect.* 3, *med.*; *cf. L.* i, *lect.* 9, *med.*

simple bodies, (which, however, is not the sense ordinarily affixed to these words in chemical treatises); so far there is nothing inconsistent with Scholastic teaching, in defending the possible existence of such molecules and atoms; and we are free to admire the ingenious efforts of Professor Cooke, in the first Lecture of his *New Chemistry*, to determine their minimum of size. Further: It is obvious that whatever can be done mechanically, is capable of being done by the operation of nature. Therefore, it is not absolutely impossible that there should be in nature *such* molecules and atoms in a state of physical isolation. As a fact, some devoted disciples of the Scholastic philosophy incline to the opinion, that such is actually the case in the instance of gases; though the present writer feels compelled to add that, to his mind, such an opinion is inconsistent with the peripatetic teaching in regard of quantity in its relation to the unity of material substance. To such extent, however, from a purely physical point of view an atomic theory is tolerable. But if we are further to understand that each atom and each molecule, so called, of each and every material substance exist, not possibly and virtually only but actually and formally,—that every single body is a simple accidental congeries of actually distinct atoms,—that the atoms of each component simple body formally remain in a substantial isolation within each compound,—that chemical combination merely consists in the mutual presence and mutual action of these separated ultimates,—that a change of substance is effected by a mere change in the relative disposition of these supposed ultimates,—that, for instance, the *atoms* of oxygen and those of hydrogen remain substantially the same in the water, or the pronounced difference between ammonic cyanite and urea is due only to a change of disposition in the atoms,—if these and similar propositions, or any one of them, are supposed to form a necessary part of the atomic theory; then the Scholastic metaphysician is compelled unhesitatingly to reject this theory as false and philosophically untenable. Nor can it be well understood how a discipline, such as chemistry, which is wholly based on facts of experience and on phenomena open to sensile perception, can insist upon a view whose principles, far from being confirmed by the testimony of the senses, are apparently at open war with it; or how it can maintain, in defiance of the principle of causality, that new entities can arise out of others with properties distinct and often contrary to those of

their components, by a mere accidental change of arrangement in the primitive and perdurable atoms. If substances cannot be recognized by their properties, and a change of substance by a change of properties; one is at a loss to know how they are recognizable at all. Finally: Such teaching annihilates the fundamental distinction between mechanical mixtures and chemical compounds; since, in the one as in the other, the two components would remain in their pristine integrity.

b. If we regard the same theory from a metaphysical point of view, the difficulties thicken. For it is impossible to admit a real ultimate; since, so long as there is quantity and extension, which are the essential properties of a natural body, there must be potential parts,—an up and a down, a right and a left,—and in consequence a capability *de potentia absoluta* of further division. Moreover: There would be no substances but the atoms of the simple bodies; all the rest would be accidental congregations of homogeneous or heterogeneous substances. Thus the only substances would be these imperceptible atoms which accidentally form the substratum of the visible. For further consideration of this part of the question, the reader is referred back to the second Chapter of the present Book, (Article i, § 4).

Note II.

Let us now proceed to compare the teaching of St. Thomas concerning the reproduction of plants with the modern discoveries in botany. Plants are the lowest grade in the scale of life; so that with them it is natural to commence our inquiry. St. Thomas has some very curious and noteworthy observations about the reproduction of plants, which shall serve us by way of text. 'Now, it should be understood,' he writes, 'that, as the Philosopher says in his Book *De Generatione Animalium,* the active principiant of reproduction is in the male, the passive principiant is in the female. And, as in a plant, whose life is principally ordained to reproduction, there is at all times one body in which both principiants are united; so, in animals that are ordained to higher vital acts than those of reproduction, not always is there one body possessing both principiants[1].' Again: 'There are some living entities that have

[1] 'Est autem intelligendum, quod, sicut dicit Philosophus in lib. de Generatione Animalium, in masculo est principium activum generationis, in femina est passivum.

the active and the passive faculty of reproduction combined; as occurs in plants that are generated from seed. For plants have no nobler act than that of reproduction. Hence, as is fitting, the active faculty of reproduction is always combined with the passive. On the contrary, the active faculty of reproduction attaches to perfect animals by their belonging to the male sex; the passive faculty, by their belonging to the female sex[1].' Once more: 'In plants, which have an imperfect life, there exists in one and the same individual both faculties,—to wit, the active and the passive; albeit it may happen that in one plant the active faculty predominates, and the passive faculty in another. And for this reason one plant is even *called* male and another female[2].' Finally: 'In all reproduction there is an active and a passive faculty; but in plants both are in the same individual, while in perfect animals they are distinct. Wherefore, in the act of generation the male and female act a part similar to that enacted in plants by means of one and the same body alone[3].'

Now, it is immaterial to the present purpose, whether Aristotle and St. Thomas knew anything definitely about the fertilization of the germ-cell by the sperm-cell, as it is now taught. It is probable that they did not. Anyhow, there is that in their teaching with respect to the Efficient Cause of the reproduction of plants, which in its fundamental principles admirably harmonizes with what is at present taught us by botanists. The proof of this assertion will necessarily involve a great deal of detail, which will

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Et sicut in planta, cujus vita principaliter ordinatur ad generationem, semper est unum corpus, in quo utrumque principium unitur; ita in animalibus, quae ordinantur ad altiores actus vitae, non semper est unum corpus habens haec duo principia.' *In* 1 *Corinth. c.* vi, *lect.* 3, *medio.*

[1] 'Quaedam vero habent virtutem generationis activam et passivam conjunctam, sicut accidit in plantis quae generantur ex semine; non enim est in plantis aliquod nobilius opus vitae quam generatio; unde convenienter omni tempore in eis virtuti passivae conjungitur virtus activa generationis. Animalibus vero perfectis competit virtus activa generationis secundum sexum masculinum, virtus vero passiva secundum sexum femininum.' 1ª^{ae} xcii, 1, *c.*

[2] 'In plantis autem quae imperfectam vitam habent, est in eodem utraque virtus, activa scilicet et passiva: quamvis forte in una planta dominetur virtus activa, et in alia virtus passiva: propter quod dicitur etiam una planta masculina, et alia feminina.' 3 *d.* iii, *Q.* 2, *a.* 1, *c.*, *v. init.*

[3] 'In qualibet enim generatione est virtus activa et passiva; sed in plantis utraque est in eodem; in perfectis autem animalibus distinguuntur. Et ideo in actu generationis ita se habent masculus et femina in animalibus, sicut in plantis solo eodem uno corpore fit.' *In Ephes. c.* 5, *lect.* 10, *init.*

be the more readily excused because of the interest as well as importance attaching to the inquiry.

i. St. Thomas asserts that reproduction in plants differs from animal reproduction, in that, with plants, the active and passive faculties of reproduction—exercised by means of the sperm-cells and germ-cells respectively, as would be said now—are united in one and the same individual; whereas in the more perfect orders of animals, they exist in separate individuals sexually distinct. Is this principle true? Is it valuable? But, first and foremost, is it in accordance with the facts that are revealed to us in modern botany? Let us see.

All vegetable reproduction, we are told, takes place either by means of asexual reproductive cells or by germ-cells, or oospheres. The asexual reproductive cells, with which we naturally commence, assume the shape of spores, gemmae, bulbils, conidia, buds, gonidia, etc.

Reproduction in the lower plants is ordinarily effected by means of spores. 'The term "spore" is unfortunately currently used in cryptogamic botany in the widest and vaguest sense. In Fungi, Mosses, and most Vascular Cryptogams' (so called from their internal structure) 'the spores are asexual reproductive cells in the sense here employed, as also are the "tetraspores" of the Rhodosporeae. But the "zygospores" of Conjugatae and the "resting-spores" of the Fucaceae are oospheres which require to be fertilized in order to enable them to germinate[1].' We may ignore for the time the latter species of spores, because they are sexual cells, and limit our attention to the former. These are either primitive asexual cells, or asexual cells which are the product of a previous sexual conjugation. But such difference has little or no bearing on the present question. That which concerns us now is, that these spores, (accidents of the plant to which they belong), wholly destitute of sexual differentiation, by virtue of the substantial form of the plant produce mediately a new individual of the same species, by first producing a prothallium which developes antheridia and archigonia,—the two sexual cells, by the conjugation of which the new individual is generated. It may be well to subjoin *en passant*, that this is an instance of alternate generation, (as it is called), common

[1] *Thomé's Text-Book of Botany, ch.* v, *p.* 178, *note* 1, (by the editor and translator, A. W. Bennett).

to so many of the cryptogams. So far, then,—to speak metaphysically,—the same plant includes within itself the receptivity of the Subject as well as the activity of the Efficient Cause. Gemmae are groups of cells which develope on all parts of the plant, and occur more especially in the muscineae,—a botanical division which embraces the mosses and liverworts. Bulbils are similar to gemmae, but they 'are endowed in a high degree with the power of independent life; they become spontaneously detached from the parent plant, and, when they fall to the ground, continue to grow like seedlings[1].' They are more commonly to be found in bulbous plants; but nodular formations called bulbils occur in one of the characeae, or submerged aquatic plants, and in some ferns. Here, too, the active and passive faculties exist in the same plant; not only so, but they seem to function within the limits of the same part. We may pass by conidia and gonidia; since, for the purpose of the present examination, they may be treated as more or less abnormal spores; the former appearing in moulds, the latter almost exclusively in lichens. There only remain, therefore, buds, under which it may not untruly be said that gemmae and bulbils are included. Buds have a special interest for us; since they not only propagate new plants asexually according to order of nature, but occupy likewise an important place in the art of gardening. They will appear again during the course of this Note. At present we are only concerned with them as agents of asexual reproduction. Besides natural propagation by means of them,—such as occurs in liverworts, for instance, by the decay of the thallus, or stem, and the independent growth of the shoots,—there are two gardening operations by which buds are made to do duty in the same way. The one is that of cuttings, which are severed from the parent-plant and develope into an independent life and growth. The second operation is natural as well as artificial, and is accomplished by means of runners. These runners are long stems that run along the ground, send out new roots at intervals, and form new plants. Such is the usual mode of propagating strawberries; and we have another instance of the same process in the pegging of verbenas.

So far, then, we are in presence of phenomena of the deepest interest and importance in connection with the subject of the

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[1] *Thomé's Text-Book of Botany, p.* 180.

present remarks. Let us content ourselves for the moment with noticing the fact that, in the variety of ways specified above, reproduction of plants is effected asexually. But what does this mean, if not that one and the same plant possesses within its own cells the active and passive powers of reproduction combined in itself?

But the examination is by no means exhausted as yet. For the orders of plants that have been hitherto noticed are sexually as well as asexually produced; and in many cases the spores (as has been already mentioned) are the product of a previous sexual reproduction. In short, all plants exhibit a like capacity for sexual reproduction. In all it would appear that there are female-cells possessing the passive faculty, and male-cells possessing the active faculty of generation. The simplest and rudest form of this sexual reproduction is that found among the conjugatae (water-plants, so called from the nature of their generation) and diatomaceae (also minute water-plants, included by Thomé under the conjugatae). The generative act consists in the conjugation of two cells, which forms the zygospore, or fertilized egg, so to say. In the cases mentioned, the conjugating cells are to all appearance similar in size and form; but 'they probably differ internally,' writes Professor Sachs, 'since it is difficult to explain on any other hypothesis the necessity for their union into a product capable of development (the Zygospore). In some other Conjugatae, as Spirogyra, this internal differentiation is exhibited at least to the extent that the contents of one of the conjugating cells pass into the other which remains stationary.' The same author adds: 'The difference between the sexual cells is developed only gradually and step by step, like the external and internal differentiation of plants; and it is this that renders it probable that in the lowest forms of the vegetable kingdom, as in the Nostocaceae' (a class of algae or sea-weed) 'no process at all of this kind exists, or that at all events there are plants of extremely simple structure in which no such process occurs[1].' The aim and necessary limits of this Note preclude any pursuance in detail of the gradual progress of sexual development, which may be said to commence from the conjugating cells just described and to terminate with the pistils and stamina of the angiosperms.

[1] *Sachs' Text-Book of Botany*, *B.* iii, *ch.* 6, § 30, *p.* 802: Translated by MM. Bennett and Dyer.

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In the presence, then, of this all but universal—if not strictly universal—reproduction of plants by means of sperm-cells and germ-cells; can the assertion of the Angelic Doctor be defended, that plants have the active and passive faculties of reproduction united in one and the same body? There is good reason for asserting that, even in respect of the higher orders of plants, the doctrine of St. Thomas is unexceptionally true; as will appear from what follows. The great majority of plants that admit of reproduction by means of what may be generically called sperm-cells and germ-cells, is monoecious,—that is to say, the male and female cells are to be found in the same individual plant; dioecious plants,—in which the two kinds of cells exist only in separate plants,—are in a very decided minority. Again: In the greater number of monoecious phanerogams the flowers are hermaphrodite, or bisexual,—in other words, the sperm-cells and the germ-cells exist together in the same flower. When the flowers are diclinous (as they call it), or unisexual, the plant may be monoecious; in other words, if the stamina alone are on one flower and the pistil or pistils by themselves on another, the two flowers may grow on the same plant. Nor does it in any sort militate against these facts, that nature has made rich provision in order to hinder the self-fertilization of hermaphrodites and to convey foreign pollen to the stigma; for this does not affect the truth of the statement, that the active and passive faculties exist in one and the same plant, though the former act upon, and the latter be acted upon by, the cells of another plant. Again: The comparatively few instances of dioecious plants,—such as, for instance, willows and poplars (salicaceae) and the juniper among the coniferae,—form no exception to the general principle enunciated by St. Thomas; since they are capable of reproduction, in one way or another, by means of asexual reproductive cells. Finally: A very strong corroboration of the statement of St. Thomas is derived from the phenomena of what has been styled *Alternation of generations* in plants. Previously to presenting the reader with a statement of the facts from which the confirmatory conclusion is drawn, it will be absolutely necessary to determine the meaning of the terms employed. Thus then: The active generation of asexual reproductive cells is in this connection itself called asexual; while the active generation of sexual cells is in like manner itself called sexual. The terms, therefore, *sexual* and *asexual* are often applied

to active generation by an extrinsic denomination borrowed from the passive generation, or from that which is generated. Hence, an active generation, though proceeding from two sexual co-principiants, may be asexual, because that which is generated has no sexual differentiation. Understood by the light of this explanation, an alternation of generations means this; that the active generations, proceeding from the substantial form of one and the same ancestral plant, produce now sexual reproductive cells, now asexual reproductive cells, and corresponding plants in a regular order of alternation. It sometimes happens, as in the instances of the hypodermiae and of rust of corn among the fungi, that the alternation is not dual but serial. However, this difference does not affect the argument; so, for the sake of greater clearness, it will be better to confine our attention to the binaries. The quasi-definition of Thomé may here serve by way of introduction to the facts that are about to be adduced. 'By alternation of generations is meant,' writes this author, 'that the mode of reproduction varies according to the generation. This occurs especially in the fresh-water Algae, where an individual which is developed out of a swarmspore' (asexual) 'itself produces sexual organs, and *vice versa*[1].' Among other forms of reproduction we meet with one which commences with an asexual generation of the pro-embryonic branches, (similar in their structure to the pro-embryos that arise from spores), from which are produced the sexual leaf-bearing plants with their male globules and female nucules. In the characeae, (a class between the algae and the mosses), the same writer tells us that 'the sexual generation is developed from the growth of a single cell of the pro-embryo, situated at some distance below its free extremity; this cell giving rise to a set of leaves, among which a bud appears which grows into a new Chara[2].' Young liverworts, on the contrary, commence with a sexual, from which proceeds an asexual generation. The same alternation occurs in the instance of ferns. Speaking generally, the vascular cryptogams, of which the ferns form an order, are 'characterized by the development from the spore of a leafless embryo of small size, bearing the oospheres' (the female organs) 'from which, after fertilization, the spore-bearing plant is produced. The former is,

[1] *Text-Book of Botany, ch.* vi, *p.* 253.
[2] *Ibidem, p.* 296.

therefore, the sexual, the latter the non-sexual generation[1].' To this class of facts may be here added another which is yet more significative. It would appear that the process of pollination in certain instances itself produces the female cell in the mother-flower. Professor Sachs is the authority for this statement. 'Hildebrand has shown,'—thus he writes,—'that in all Orchids which he examined the ovules were not in a condition to be fertilized at the time of pollination; and in some (as *Dendrobium nobile*) they have not even begun to be formed; it is only during the growth of the pollen-tubes through the tissue of the stigma and style that the ovules become so far developed that fertilization can at length be effected. *In the Orchideae the formation of the female cell is therefore a result of pollination; it is determined by the action of the male pollen-tube on the tissue of the mother-plant*[2].' From the above facts a further conclusion may be drawn, in favour of another principle of living reproduction maintained by the Angelic Doctor. For, since in all alternate generations the reproduction, or thing reproduced, ends where it began; it is quite clear that the intervening forms are provisional: But this by the way. That asexual generation, then, produces sexual, and sexual asexual,—that in particular the sexual differentiations proceed from one and the same Efficient Cause, is no uncertain proof that the primitive substantial form contains within itself both the active and passive faculties. The last-mentioned fact about the orchids evinces this yet more evidently. For the female cells are clearly accidents of the plant to which they belong, since they are the effect of a foreign agency. If, then, as we have seen, the male cells have the power (derived, of course, from the plant-form to which they belong) to form the female cell in another plant; nothing can be clearer than that the substantial form of the male plant must have the passive no less than the active faculty, since nothing can give that which it does not virtually itself possess. This argument is capable of being carried a step higher, so as to include all the phanerogams. Let us once more summon Professor Sachs as a witness. He tells us that 'the Alternation of Generations in Phanerogams is concealed in the formation of the Seed, which, at least in its earliest stage, consists of three parts:—(1) The *Testa*, which is a part of

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[1] *Text-Book of Botany, p.* 245.

[2] *Ibidem, B.* iii, *Ch.* 6, § 31. The last Italics have been introduced here.

the mother-plant; (2) The *Endosperm*; and (3) The *Embryo*, the result of the development of the oospore or fertilized embryonic vesicle (oosphere)[1].' It may be said, then, that the seed is after a sort an asexual reproduction, resulting by its germination in the sexual generation of the new plant. It is perhaps in this way that we may explain the words of St. Thomas, that the combination in one individual of the active and passive faculty 'occurs in plants that are generated from seed.' It should be further added, that the existence of dioecious plants fully justifies the observation of the same Doctor, that 'sometimes in one plant the active virtue predominates, and the passive virtue in another. And for this reason one plant is called male, and another female.'

ii. The Angelic Doctor, in the first two passages quoted at the commencement of this note, indicates the final cause of this conjunction of the active and passive faculties of reproduction in one and the same individual body. He declares that plants have no higher natural operation than that of reproduction. But natural operation attests the immediate final cause. Wherefore his inference is just, that propagation and multiplication are the immediate final cause of plants. Here again the teaching of botanists in this nineteenth century echoes the conclusion of the Angelic Doctor. Professor Thomé's words in the following quotation are an unconscious commentary on St. Thomas: 'The great office,' he writes, 'assigned to vegetation of covering the surface of the earth with forms of organic life, and transforming inorganic into organic substances in order to support the life of man and other animals, requires that plants be endowed in a remarkable manner with the power of reproduction, that is, of producing individuals of the same species, in order that the short duration of all earthly life may not result in the world being soon deprived of its covering of vegetation, and all life perishing in consequence. For this purpose, particular cells of the plant begin, at definite times, an independent growth, and thus carry on a life of their own, often not in connection with the parent plant. Such cells are called *reproductive cells*, and the plant which results from one of them constitutes a distinct generation[2].' The only marked distinction between the teaching of the German Professor and that of the Angel of the Schools is, that the former is—to

[1] *Text-Book of Botany*, B. ii, *Group* 5, *p.* 421.

[2] *Ibidem*, *ch.* v, *p.* 177.

borrow from the sonorous vocabulary of the day—more pronouncedly *teleological.*

iii. The task that now awaits us is that of applying the doctrine of St. Thomas, together with the illustrative facts that have been collected, to the main subject of this Chapter. Wherefore,

1. It behoves us to inquire what are the instrumental causes, if there are more than one, that the plant-form uses in the process of reproduction. Can a general answer be given to the question, which will embrace, not only all the different divisions and orders of plants but, in particular, the multifarious methods of generation? First of all, it is obvious enough that a remote instrumental cause is to be found in that active faculty of reproduction which is an essential property of the plant-form; though, strictly speaking, it can hardly be called an instrumental cause, since it is the faculty by which the substantial form necessarily generates, as being its own essential property that alone determines it to the act. But what is the real proximate instrument? It is in every case the actively reproductive cells. It is apparent from careful observation of the anatomy and structure of plants, that there are, in every plant, cells that are reproductive and cells that are not reproductive, but either go to build up the tissue or assist in the functions of assimilation, nourishment and growth. The former, it would seem, are distributed over every part of the plant, as if to make sure that nature shall not be deprived of her necessary fertility. They appear on root, stem, leaves, axils of leaves, on branch and flower; and art avails itself of the known fact. Among these reproductive cells, however, there is (as we have just seen) a very marked difference. Some there are, which only become reproductive in conjunction with cells of another character receptive of their action; and the result is a sexual generation. There are others which seem to contain within themselves the function at once of agent and Subject. These are fertile, as it were, in their own right; and here the result is an asexual generation. It is further noteworthy, that in proportion as the plant rises in the scale of perfectness, so do the sexual reproductive cells become specially localized; and the differentiation as well as complexity of structure of the male and female organs become more developed, while asexual reproduction becomes comparatively restricted. Thus, in the mode of propagation, vegetative life in its highest manifestations approaches to that which is distinctive of the higher grades of animal life.

2. While asexual generation is effected, as we have seen, by means of spores, buds, etc.; there are special phenomena, connected more particularly with the artificial use of these cells for purposes of propagation, which demand the special consideration of the metaphysician by reason of problems touching the Efficient Cause in such cases, to which they give rise. To commence with the processes of *cuttings* and *layering:* The two are taken together; because metaphysically they present the same difficulty, and can, in consequence, be included in one and the same examination. In cuttings a slip is cut off from the parent-plant and set by itself in the earth, where it takes root and assumes an independent life specifically the same as that of its progenitor. In layering the bent branch still retains its substantial union with the parent-stem by means of the bark, till it has struck root; when the connection is severed. In both cases, however, there is a rupture more or less complete between the off-shoot and the parent; while in the instance of layering the temporary and imperfect connection with the parent-plant serves apparently, in the main, for the purpose of provisional nutrition. The question accordingly arises: What in these two instances is the principal Efficient Cause of reproduction? This involves a preliminary question of no little moment: In all such cases of asexual reproduction, is there strictly speaking a generation? In other words, is there any eduction of a new substantial form out of the potentiality of the matter? With great diffidence in our capacity to determine so intricate a problem, we are inclined to the opinion that in no single case is there what may be properly called a generation. How, then, is it possible to explain the fact of the new existence of an individual substance? In this wise: The substantial form of a plant is quantified *by accident* in the quantification of the integral body; because in the instance of plants the form is wholly immersed in the matter. Consequently, it is capable of division *by accident*, in virtue of the division of the quantified body; while remaining essentially though not numerically one in each of the severed parts. Hence, the branch or cutting retains its substantial form as before; only this partial form has become *other* in itself, integral, independent, through the medium of the physical separation of the part from the whole. But, if this be so; how is it that the shoot or branch dies, should it not be speedily committed to the ground? For the same reason that the entire plant will die, if uprooted from the ground. But why in layering is that temporary

and partial connection of the branch with the parent-stem necessary for successful reproduction? Because the organs, by which the cell could extract nourishment for itself from surrounding bodies and would have power of assimilation, are wanting; and it is not provided as yet with a store-house of endosperm. But again, why is it that in some plants,—as, for instance, the rhododendrons and heaths,—layering is more successful than cuttings? May it not be, because in the branches of these shrubs there is a preponderance of cellular tissue and fibre over the reproductive cells? This brings us back to the original and most important question: What is the principal Efficient Cause of reproduction in the instances of cuttings and layering? The resolution of the previous question prepares us for the answer. No real Efficient Cause, other than the instrumental, is required; though other agents of growth, development, and of preservation of life, are required; about which presently. In other words, there is no Efficient Cause of substantial generation required, for the simple reason that there is no substantial generation at all. There is, indeed, a cause required for the due development of the organism of the new plant; but this comparatively easy work is accomplished by the separated form in conjunction with the co-agents just mentioned. And thus we are naturally led to subjoin the following remark. The organism of a plant is comparatively simple, because its functions are comparatively simple. Therefore the substantial form has little difficulty, in conjunction with the reproductive cells, in developing for itself a complete normal organism. When the cuttings and layerings do not take,—apart from extraneous causes, such as uncongenial soil, action of worms, insects, and the rest; the failure not improbably arises from some deficiency in the reproductive cells, which delays the organic development too long to allow of the persistence of the substantial form. There remains one more difficulty to be solved in connection with this part of our subject. It is undeniable, that what may physically be called a partial corruption of the body takes place in that part of the branch or slip which is planted or fixed in the ground. But corruption connotes generation, and substantial corruption substantial generation. Therefore, it seems necessary that we should admit the eduction of a new substantial form. The answer has been partially suggested in the *Major*. The corruption is partial only, and is not metaphysically speaking a substantial, but only an accidental corruption. It partly assumes the complexion of a wound; and in

part is necessary as a preparative for the evolution of the root. Such local and accidental corruption does not postulate a new generation strictly so called.

The next series of phenomena is connected with the artificial processes of grafting and of budding. In these processes a scion or bud is inserted in the stock of another plant, for the purpose of propagating plants or trees of a superior variety within the limits of the same genus; for, in order to succeed, the stock and the scion or bud must belong to nearly related species. If the operation is successful, the scion or bud germinates; and the result is a remarkable and interesting phenomenon. As a general rule, the spot in the stock, wherein the scion or bud has been inserted beneath the bark, forms a boundary mark. All the parts above it follow the nature of the intruded stranger; all beneath, that of the conservative stock. It is said, *as a general rule;* because Mr. Bennett, the translator and learned editor of *Thomé's Text-Book of Botany*, has supplied us with the following valuable information in a Note. 'The graft and the stock,' he writes, 'do, however, exercise a certain amount of reciprocal influence the one on the other; and in certain cases hybrids or intermediate forms between the two are produced.' These facts give rise to what looks like a formidable difficulty. For,—assuming, in the first instance, the normal result,—there is a marked diversity of accidents, which seems to argue a corresponding diversity in the substantial form; so as to lead one to suppose that the inferior part is actuated by the substantial form of the old plant, and the upper part by that of the scion or bud. Again: If we turn in the second instance to the cases mentioned by Mr. Bennett, it looks as though the form of the stock and that of the scion or bud had given place to a third form distinct from both. The former hypothesis is impossible; since two substantial forms cannot simultaneously actuate the same individual substance. The latter hypothesis would involve a substantial corruption and generation; which does not appear to be justified by the facts of experience and observation. What is to be said in reply to this difficulty,—for a difficulty it really is? First of all, it is worthy of notice that these phenomenal changes are in each case purely accidental. By this it is intended to say, that the variations produced are not specific properties. To speak botanically, they are included under the same genus. A peach can be grafted on a plum stock; but why? Because they both belong

to the same sub-order, (the amygdaleae). This sub-order belongs to the order of rosaceae, in which there is a specific uniformity of calyx, stamina, ovary, and fruit. Yet you cannot graft a peach on a rose-stock; because, though of the same order, the two are not of the same sub-order. For the same reason, you cannot graft a cherry on a mountain ash-stock; though they belong to the same order. Since, then, grafting and budding are known to succeed, only when the respective plants—the stock and the scion or bud—are nearly related; it is plain that the reproductive cells of the one must be homogeneous with, and therefore capable of becoming instrumental causes of, the substantial form that actuates the other. Accordingly, the substantial form of the stock will occupy as its own, so to speak, the cells of the scion or bud. But here comes the difficulty. For, in the hypothesis that the substantial forms of plants are capable of division with the division of the body which they inform; the scion or bud, upon its division from the parent plant, would be actuated by its own substantial form: What becomes of it? We reply that,—since two substantial forms cannot at the same time actuate the same individual substance,—as soon as complete assimilation has taken place, it makes way for the form of the stock and recedes into the potentiality of the matter. But the difficulty is pressed further. Assuming the truth of the above explanation, why should the superior form yield before the inferior? Surely, it ought to be the other way about. For answer: The inferior form of the stock is in possession. It is already endowed with all its requisite organs, accommodated to its own peculiar nature. The scion or bud intrudes, as a sort of interloper, upon the other's domain, bearing along with it some reproductive cells; and the old form exercises the right of the strongest. The stranger-cells are naturalized, on the condition that they give up their former citizenship. Yet one more difficulty remains. On such a hypothesis it is apparently impossible to explain the production of the boundary, and the occasional appearance of hybrids. May it not be said, that the reproductive cells of the bud or scion develope into an organism connatural with the form which originally produced them; and that the sap, circulating through such a medium, is translated into qualities peculiar to such form; while occasionally the cells of the two constituents may combine in process of evolution,—owing to the special vigour of the stock-form, or by accidental lesion, or for other imaginable reasons,—and may thus

result in the production of a hybrid as consequence of mutual modifications? In the former and more ordinary case, the sap, passing upward from the root, will circulate through a varied organism, and thus cause a boundary-line corresponding with the variation in the organs.

There is another solution of the above problem, that might be propounded. It might be said that, as the substantial form in plants is by accident divisible in virtue of the quantitative division of the body; so in like manner two substantial forms under the same conditions and for the same reasons are capable of coalition, in virtue of the conjunction of the two bodies of which they are respectively the acts. But such a solution is untenable for two reasons. In the first place, it would postulate the divisibility of the substantial forms of plants *per se*, not by accident only: because, subsequently to the complete grafting or budding, the quantity is undivided. In the next place, it supposes the possibility of two substantial forms partially informing one and the same bodily substance. These arguments presuppose that by coalition is meant quantitative coalition. If the solution is based on the idea of an entitative coalition; such a coalition is contrary to the essence of a substantial form, which is simple. Further: This latter hypothesis would only account for the comparatively rare cases of hybrids, and would be incompatible with the ordinary phenomena of a boundary line.

iv. The last question in the present Note is connected with the joint-agents to which allusion has been already made. It relates to the nature of solar efficiency in the production, preservation, and growth of plants. Are the light and heat of the sun direct Efficient Causes of generation and growth, in conjunction in the one case with the substantial form of the parent-plant, in the other with that of the newly generated plant; or are they only dispositive causes? The Angelic Doctor evidently considers the sun to be a concurrent cause towards the reproduction of plants; to such extent that,—taking for granted the existence of spontaneous generation in the vegetable as in the animal kingdom, which was a common opinion in his day and is not altogether without its advocates in our own,—he and the philosophers of the School generally attributed such generations to the sun as to the principal agent. This opinion was in great measure due to another touching the unique and excelling nature of the primordial matter and of the forms

which together constitute the heavenly bodies. It thence followed, that the natures of the heavenly bodies would be of an order vastly superior to that of even the noblest sublunary bodies. Further: These bodies, more particularly the sun in relation to ourselves, were justly held to be equivocal causes, virtually containing in themselves a plurality of effects. About this there is no room for doubt. On the strength of these assumptions, it was concluded that, where the principal agent of generation was either wanting or physically separated from the Subject of operation, the heavenly bodies supplied the place of such agent by assuming its functions. Such was more or less the teaching of the old peripatetic philosophy. There is another point in the teaching of St. Thomas touching this problem, which it may be well to add. He evidently holds that the sun, though cause of heat, is not itself an excandescent body. To this effect he introduces it as an apt illustration of a very important axiomatic truth. 'Effects,' he writes, 'fail to imitate those of their causes that are of a higher grade than themselves; and by reason of such distance of the cause from the effect, something is truly predicated of the effect, which is not predicated of the cause. Thus, for instance, it is plain that things which afford delight are not said to receive delight, though they are causes of delight to us. Now, this only happens, because the character of the causes is too noble for those things which are predicated of the effects. And this we find in all causes that act equivocally. Thus, for instance, the sun cannot be pronounced hot, though other things receive heat from it; and this arises from the eminence of the sun itself over those things which are pronounced to be hot[1].' Further: St. Thomas considers heat to be a term of motion; and, as all motion is ultimately referrible to the first principiant of motion among the secondary causes, (which in all corporal motion is, according to him, the heavens), it follows that all causes of heat produce alteration in other bodies, only forasmuch as they are moved by the heavens. Accordingly, he

[1] 'Causata deficiunt ab imitatione suarum causarum, quae eis supercollocantur; et propter istam distantiam causae a causato, aliquid vere praedicatur de causato quod non praedicatur de causa; sicut patet quod delectationes non dicuntur delectari, quamvis sint nobis causae delectandi. Quod quidem non contingit nisi quia modus causarum est sublimior quam ea quae de effectibus praedicantur. Et hoc invenimus in omnibus causis aequivoce agentibus; sicut sol non potest dici calidus, quamvis ab illo alia calefiant: quod est propter ipsius solis eminentiam ad ea quae calida dicuntur.' *Verit. Q.* iv, *a*, *b*, *c*.

writes: 'Now, we see that in things bodily not only is the form itself, which is the principiant of motion or action, required for motion; but there is also required the motion of the first cause of motion. But the first cause of motion in the order of bodily things is the heavenly sphere. Hence, to whatsoever extent fire may have perfect heat; it could not effect alteration,' (that is to say, produce heat in another), 'save by means of the motion of the heavenly sphere[1].'

In most of the propositions that have been here set before the reader, there is much that does not square with modern physical teaching. Nevertheless, it is of importance that we should know them, in order to be able to appreciate the motives that induced the ancients to attribute to the sun such paramount influence over vegetative life. There is one point,—the really important one in the present inquiry,—on which the Doctors of the School and the modern physical authorities are agreed. They both make high account of the causal action of the sun in the phenomena of vegetative life. But it would seem as though they were not of accord touching the nature of this causality, which is the subject of discussion proposed in this Number of the present Note. The Doctors of the School would appear to hold that the sun is a principal joint agent in the generation and growth of plants, and further, that when necessity urges, it is competent to assume by itself the functions of the principal cause; while the tendency of modern physical observation and consequent inference is to reduce it to a merely dispositive cause in both the first generation and the subsequent growth of life. The writer, although the weight of such high authorities causes a natural hesitation, feels compelled by what seem to him the most solid reasons to incline towards this second opinion. Under these circumstances it is only becoming that he should set before the reader the physical facts, established in recent times, that serve to throw light upon the question; and then to weigh impartially, to the best of his ability, the evidence, so as to arrive at the conclusions towards which these facts seem to point. So now for the task before us.

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[1] 'Videmus autem in corporalibus quod ad motum non solum requiritur ipsa forma, quae est principium motus vel actionis, sed etiam requiritur motio primi moventis. Primum autem movens in ordine corporalium est corpus caeleste. Unde quantumcumque ignis habeat calorem perfectum, non alteraret, nisi per motionem corporis caelestis.' I-2^{ae} cix, 1, *c.*

1. Every solar beam is composed of rays differing (according to the modern theory of light, etc.) in length of undulation, and whose respective intensities are dependent upon the amplitude of their waves. There are, in particular, three kinds of such rays, —the luminiferous, calorific, and actinic. It will be seen presently that it is germane to the present inquiry to subjoin a fourth. For the moment, let us limit our attention to the three just named. It is worthy of observation, that a luminiferous ray is accompanied by the other two; yet the respective curves of the three in measure of intensity are by no means coincident. The curve of brightness—that is to say, of the luminiferous rays—reaches its maximum of intensity on the border of the yellow and the green in the solar spectrum; while that of heat—of the calorific rays—reaches its maximum beyond the red, where no light is perceptible. The curve of actinism—or of the actinic rays—takes an exactly opposite direction to that of heat, and reaches its maximum beyond the indigo and violet, where again no light is perceptible. Let us now add a so-called fourth set of rays which, because of the effects produced by them, may be called assimilating rays, though they are really identical with the luminiferous,—the two terms being exclusively derived from the diversity of the effects. Their curve of intensity is similar to that of the luminiferous rays, for their maximum is the same; nevertheless, there is an appreciable difference. For between the yellow and the orange the intensity of action of the assimilating rays (or of the rays as assimilating) is diminished something like four-fifths[1]. Now, of these classes of rays the luminiferous, as such, can obviously have no effect whatsoever on vegetative life, for light is an effect exclusively referrible to the optic nerves of animals; or,—to put the same idea into a more scientific shape,—these rays, considered solely as productive of the effect of light, have no bearings on vegetative life. Each of the three other classes has apparently its own determinate and distinct effect on plant life and growth. The assimilating rays assist the chlorophyl of the leaves in the important work of assimilation: Hence their appellation. They

[1] The facts here recorded are chiefly taken from the excellent Book of Botany by Professor Sachs, who has added a diagram in which the curves of intensity of the rays in their relation to the solar spectrum are represented, with the exception of that of the actinic. The Work has been translated from the German by MM. Bennett and Dyer.

seem, moreover, to have a direct effect on the production of the chlorophyl-bodies. The rays of heat would seem to have an influence on generation, or the first evolution of life, and growth of tissue. The actinic rays are supposed to have a more special influence than the others on the plant-food, and other similar phenomena, by their known chemical action. Now, though it is true that, within the limits of the luminous portion of the spectrum, the four (so to number them) are united, and that the three have a united effect on vegetable life, though in a constantly varying ratio; yet beyond such part of the spectrum, on the side of the rays of less refrangibility, the rays of heat energize without the assimilating and actinic, and beyond the same, on the side of the rays of greater refrangibility, the actinic rays energize—and that too most powerfully—without the assimilating and calorific. Hence, the process of assimilation in plants principally requires the presence of light; in such wise, that it ceases during the time of darkness. The process of reproduction, growth, and what is called metastasis, (a process by which the products of assimilation undergo chemical metamorphosis of various kinds), postulates more particularly the presence of heat. Accordingly, plants grow more in darkness than in the light. Intimately connected with this latter is the chemical resolution of the food from which the plant derives its nourishment, and the process of intussusception, which are both promoted in a special manner by the actinic rays. It need hardly be said, that there is an intimate connection existing between these several functions of the plant; just as within the limits of the luminous spectrum, the assimilating, calorific, and actinic rays are always found together. Nevertheless, as observation and experience prove that the plant-functions are really distinct; so there are similar reasons for coming to the conclusion, that the respective actions of these several classes of rays are really distinct, though more frequently combined.

2. It cannot be doubted that this threefold action of the sun is connected either with the generation or with the life of the plant; —heat, with both. But the doubt may arise, whether it is necessary. And there are certain physical facts which seem at first sight to militate against such a conclusion. The most telling, perhaps, of these facts is that of what are called etiolated plants. It is an undoubted fact, which is capable of easy experimental proof, that seeds germinate and grow to maturity in that which

to sensile perception is utter darkness, such as may be found in an underground cellar. The effect on the plant is singular. It will be entirely blanched: Hence, its appellative. But, on the other hand, its tissue-growth is abnormally great; while its leaves in many cases are proportionably small. 'The internodes,' writes Professor Thomé, 'of the stems of blanched or etiolated plants grown in the dark are often elongated to ten or twenty times their ordinary length; while leaves of Dicotyledons and Ferns, which are normally broad and branched, remain, when grown in the dark, remarkably small. Under these circumstances the lamina of the leaf of *Tropaeolum* attains scarcely from $\frac{1}{30}$ to $\frac{1}{20}$ of its normal size; the leaves of Ferns do not even unfold, and attain only $\frac{1}{100}$ or even $\frac{1}{1000}$ of their normal superficial development in the light[1].' Here we have, as the result of the exclusion of light, an abnormal increase of size in one part, and an abnormal stunting in another part, of the plant. This is curious enough, as denoting a distinct and opposed result in the instance of the tissue and the leaf, indicating thereby a peculiar absorption of starch in the tissue. But, after all, it lives without the aid of the assimilating rays; and it was generated without their aid: How is this? Does it show that the action of the sun is not necessary to its life and growth? Its colour tells plainly enough that it is destitute of chlorophyl; so that it does not possess even the organ necessary for the process of assimilation. This last statement is not entirely true. In the instance of these plants that are grown in the dark, chlorophyl-grains are produced by metastasis; nevertheless, they are of a yellow colour, and are as yet unfitted for their function of assimilation, and remain so till submitted to the action of the luminiferous rays. Therefore, the difficulty is not solved. Neither is it of any great service towards a satisfactory answer, even if we accept the statement of Professor Sachs that, though chlorophyl cannot be formed in the dark in the instance of angiosperms, yet 'the green colouring substance is formed in the cotyledons of Conifers and in the leaves of Ferns in complete darkness as well as in light[2],' (though the fact will be of some use to us presently); because it is quite sufficient for the argument, that it is not so with the higher orders of plants. Indeed, one instance is enough. Here is a plant that has been generated, and has

[1] *Text-Book of Botany, ch.* v, *pp.* 212, 213.

[2] *Ibidem, ch.* iii, § 8, *p.* 665.

grown, and still lives, in the dark; and it is destitute of chlorophyl, —at least in such a condition as to be competent to function. Finally: Even if it had its chlorophyl in right order; it could not function without the action upon it of the assimilating rays. How, then, can it live? The botanists reply, that these plants probably live on the supply of assimilated reserve-material contained in the cotyledons and endosperm. When it has absorbed its reserve-material, it necessarily dies. There can be no difficulty about the abnormal growth of the plant; since growth is hindered rather than promoted by light. This is why plants eliminate oxygen in the day and carbonic acid at night. The former is the result of assimilation, the latter of metastasis. Assimilation with metastasis gives formative material; growth expends it. Once more: It must not be forgotten that all solar action is not excluded in the instance of these etiolated plants; for the solar heat can reach them indirectly by radiation. The phenomena, therefore, of these growths in the dark do not disprove the necessity of solar action.

3. Another objection to the necessity of the action of the sun's rays is based on the fact, that artificial light will answer precisely the same purpose, provided that the intensity is the same. As a fact, the electric light is proved to be equally efficacious. Not to be obliged to repeat the same objection and answer: The same fact is established in the instance of heat; of which the use of hot-houses affords abundant evidence. This is, indeed, a serious difficulty; and it tells forcibly in favour of the conclusion towards which we are tending. But it can hardly be said to impugn the necessity of solar action to vegetable life, for two reasons. The necessity defended is a practical necessity in the ordering of nature, which obviously no artificial means could meet. In the next place, artificial light and heat are precisely the same effects, produced by the same medium or instrumental cause, as solar light and heat. They only differ in their principal agent. Wherefore, to all practical purpose they are identical.

4. Another powerful proof of the necessity of solar action to vegetative life is taken from the agency of heat. There are certain thermometric limits in both directions, (varying to some extent according to the nature of the plant), beyond which the functions of life,—and, under certain circumstances, life itself,—are arrested. An ordinary example of this occurs in the process of

converting barley into malt for the brewery. A definitely moderated heat is first applied to the grain which is soaked in water; and by these appliances the grain begins to germinate. Afterwards in due course a more intense heat is applied, which kills the newly born plants. Without this normal heat the seeds would not have germinated. Again: The presence of a certain degree of heat is requisite, in order that the chlorophyl—even though under the action of light—may be capable of decomposing carbon dioxide. Thus it would appear that heat is more necessary to vegetative life than even light.

5. An objection has been urged against the causal action of the sun in the phenomena of vegetative life,—viz. that air, earth, water, are equally necessary to the plant; yet no one dreams of making these into Efficient Causes of plant-life and growth: Why, then, the light and heat of the sun? Here again there is a solid element of truth in the difficulty, which will prove of service presently. Yet, taken in its entirety, the inference is baseless. There is an evident difference between the two classes of things in their relation to the plant. Earth, air, and water are so many reservoirs that contain its nourishment. They are rather acted upon, than act. But the solar rays do not enter into the physical constitution of the plant. In some way or other they act upon it. So, the former belong to the material cause, the latter to the Efficient; both necessary within the limits of their own proper causality.

6. We are now in a position to enter upon an examination of the fundamental question so intimately connected with the subject-matter of the present Chapter. There are two points clearly established by that which has gone before. The sun certainly exercises a marked causality in the phenomena of vegetative life; and this causal action, in the ordering of nature, is practically necessary. It now remains that we strive to determine, whether it directly co-operates with the substantial form of the parent-plant in generation and with that of the plant itself in its vital functions, or whether its action is purely dispositive,—that is to say, disposes the matter in the one case, and the particular organ in the other case, for the operation of the substantial form. The action of the actinic rays may be at once dismissed; since there can be no doubt that their main work is to dispose the outside material for intussusception, as it is called. Accordingly, the inquiry is limited to

heat and light,—or, in other words, to the action of the calorific and assimilating rays. The following are the reasons that seem conclusive in favour of the second of the two opinions just mentioned.

a. The fact that artificial light and heat produce the same effect on plants as solar light and heat, abundantly suffices to prove that the sun has no efficiency, as touching plant-life, in which other sources of light and heat do not participate; unless one is prepared to accept the theory, that the radiating power in other bodies is communicated to them by the superior causality of the sun, as first cause of all motion in bodies. This theory once excluded, there is no more reason why the sun should take the place of the principal agent of generation in defect of this latter, than the bodies (for instance) that cause the electric light or the fire giving forth heat. Any argument, therefore, in defence of the direct causal efficiency of the sun, that is based on the supposed supremacy of this heavenly body over all the motions of nature, must be abandoned as being deduced from a false premiss.

b. The primary distinction between animate and inanimate bodies consists in the fact, that in the former the principiant of motion is intrinsic, in the latter extrinsic. It does not seem to be in harmony with this undoubted truth, that the sun should be a necessary joint cause, or principal agent, of the generation and vital functions of plants; because in this hypothesis the principiant of operation would not be wholly intrinsic.

c. The nature of the sexual generation of plants seems to exclude the direct joint action of the sun in vegetative reproduction. For the act of fertilization essentially consists in the conjugation of the male and female cells, and in the causal action of the former on the latter. It is true that the immediate result in the case of phanerogams is a seed, not a plant. But there is a great deal in the observation of Professor Sachs already quoted, that the seed is a sort of preliminary, transitional, asexual generation. It contains the plant-form virtually. The active qualities of the sperm-cell, which are the instrumental causes of generation, remain there as if in a state of sleep; ready, as soon as they are awakened, for their appointed work as deputies of the parent-form. All the necessary causal efficiency, therefore, is already in the seed; and the agent only needs arousing (so to speak), by a proximate disposition of the matter in which it lies hidden, to evolve the form. Accordingly,

all that is required is a dispositive cause. Against this, however, it may be urged, that the seed often remains seed for years, till the solar, or other equivalent heat causes it to germinate. Therefore, heat directly operates towards the evolution of the plant-form. But, on the other hand,

d. Heat will not by itself cause the seed to germinate. It may be exposed for years in a seedsman's shop-window to the action of the solar rays, yet remain a seed as before. It requires to be immersed in water or something equivalent, which is if anything more necessary to the germination than heat. Nor can it be said with any show of reason, that the water is necessary for its food; for this supposes that a thing can take nourishment before it exists. The plant does not yet live. It is obvious, therefore, that the water, precisely as the heat, is necessary merely as an agent to dispose the matter proximately for the eduction of the plant-form.

e. If heat operated as a joint Efficient Cause of the generation of the plant; it would seem as though the more completely it exerted its energy, the quicker and more perfect would be the generation. Yet, on the contrary, in order to be of assistance towards the germination, it must not exceed certain limits of intensity. Beyond these limits, as has been seen, it even destroys the life already begun. Such necessity for moderation is easily understood, if the heat is merely dispositive of the matter.

f. It is clear, from the instance of etiolated plants, that vegetative life can be both evolved and maintained,—at all events, for a considerable time,—although deprived of the direct action of the sun's rays. Nevertheless, there are certain qualities, requisite for the function of assimilation, which cannot ordinarily be developed save under their direct influence. These facts appear to imply that the sun's action is purely dispositive.

g. It seems like a contradiction in terms, to maintain that the natural operation of any substance, but more especially a living substance, should postulate, as a necessary condition of its efficiency, the co-operation of an external finite agent. But intussusception, metastasis, assimilation, belong to the natural operation of a plant. Therefore, etc. Neither, indeed, would it appear that the Scholastic Doctors ever thought of carrying the theory in question beyond the generation of the plant. But facts of experience seem to evince, that solar action or its equivalent is more necessary to the process

of assimilation than to the first germination of the seed. 'Only those cells,' writes Professor Thomé, 'which contain chlorophyl, *and then only under the influence of sunlight*, have the power of decomposing the carbon dioxide'—the carbonic acid gas,—'which they take up, and of producing organic compounds out of its elements and those of water, with elimination of an equal volume of oxygen, or in other words of assimilating[1].' If, then, the influence of light in the process of assimilation cannot assume the form of a direct causal concurrence with the assimilating faculty, but is at the most an action disposing the organ for its work; *à fortiori* neither heat nor light can be a joint cause with the substantial form in vegetative generation.

h. Finally: Even if spontaneous generation should ever be proved to be a reality; one would be inclined to hold that the matter, having been proximately disposed by the action of heat and of other causes, of itself evolves into act by Divine Intervention, rather than that the causal action of an inanimate body should be efficacious towards the generation of life.

Note III.

For all that affects the subject-matter of the present Chapter, the lower grades of animal life present phenomena similar to those of plants. They are capable of asexual, as well as sexual generation. The former is effected by fission, (which corresponds with plant-cuttings), by gemmation or budding, and some of the polyzoa by a peculiar form of gemmation which seems to find something like its counterpart in the reproductive spores of lower plants. These statoblasts (as they are called) are certain buds formed internally on a sort of cord within the body. 'When mature they drop off from this cord, and lie loose in the cavity of the body, whence they are liberated on the death of the parent organism. When thus liberated, the statoblast, after a longer or shorter period, ruptures and gives exit to a young Polyzoon, which has essentially the same structure as the adult[2].' These statoblasts, let it be noticed, are a fresh instance of provisional and temporary forms in natural generation. Since, then, there are no phenomena of either sexual or asexual reproduction in the case of these lower animals, which require distinct discussion in this Appendix; the

[1] *Text-Book of Botany, ch.* v, *p.* 173.
[2] *Nicholson's Manual of Zoology, General Introduction, pp.* 26, 27.

reader is referred back to the application of the teaching of St. Thomas to similar facts in the previous Note, more particularly to the observations under the first Number.

Note IV.

We are at length confronted with the far more difficult and more important question touching the reproduction of the higher order of animals, including man. For though man is distinguished from all other animals,—even the most perfect,—in that the ultimate and completorial form (towards the introduction of which all previous provisional forms are accessory) is not the result of natural evolution, but immediately created by God; notwithstanding, in the gradual progress of his organization and in the development of purely animal life, (and it is thus only that he comes before us in the present Note), his generation cannot be distinguished from that of brute animals of the nobler type[1].

We will begin, according to our wont, by setting forth the teaching of the Angelic Doctor on this head. 'There are many ways,' he says, 'according to which an agent is in act: First, by its own proper form, which either contains by specific likeness the form of the effect,'—a univocal cause,—'as fire generates fire; or virtually only,'—an equivocal cause,—'as, for instance, the sun generates fire. Secondly, by motion received from another; and it is in this manner that an instrument acts as Being in act. And it is thus too that the sperm-cell is in act; forasmuch as there is in it the motion and intention of the generating soul, as the Philosopher has it in the second Book *De Generatione Animalium.* It is owing to this that it has the power of causing human nature[2].' Again: 'Whensoever there are two principiants in motion or action, which are mutually ordered, that which in the effect is derived from the superior agent is, as it were, formal; while that which is

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[1] 'Modus traductionis seminis est similis in homine et in aliis animalibus; quia in semine hominis est etiam virtus formativa, sicut in animalibus.' 2 *d.* xviii, *Q.* 2, *a.* 3, 4[m].

[2] 'Aliquod agens est in actu multipliciter. Uno modo secundum propriam formam, quae vel continet formam effectus secundum similitudinem speciei, sicut ignis generat ignem; vel secundum virtutem tantum, sicut sol generat ignem. Alio modo secundum motum ab alio; et hoc modo instrumentum agit ut ens actu: et sic etiam semen est actu, inquantum est in eo motus et intentio animae generantis, secundum Philosophum (in lib. de Gener. Animalium 2, cap. 8); et ex hoc habet virtutem causandi humanam naturam.' *Ma. Q.* iv, *a.* 1, 16[m].

derived from the inferior agent is, as it were, material[1].' Once more: 'From the actions of active qualities there results a sensile soul, and other substantial forms; forasmuch as there remains in these qualities, as in instruments, the virtue of a soul or of some other substantial form, as also of the heavens. Therefore, since they do not act in their own virtue exclusively, it is not necessary that from their action there should result nothing that is above their own specific nature; because from the motion of an instrument there results an effect in accordance with the nature of the principal agent[2].'

So far, there is no difficulty which has not received its solution in antecedent Propositions. In the animal reproduction to which the present inquiry is limited, the sperm-cell acts as instrument of the soul of the male, receiving from the latter a generative power that is wholly beyond the virtue of its own unassisted nature. It has, it is true, its own native action; but this is, as it were, material in relation to the term of generation. All this is a mere application of the doctrine touching the instrumental cause, as already declared and explained. But now comes back the old difficulty. It is undeniable that the sperm-cell—or instrumental cause in the work of reproduction—is at the time of its fecundating activity physically separated from the principal agent. It seems to generate by its own independent operation. Or can it be that the germ-cell, which remains in a sort of physical connection with the mother, is after all formally the cause of the substantial generation; while the sperm-cell fulfils the subordinate office of, as it were, supplying and arranging material? If, on the other hand, it be the sperm-cell that is instrumental cause, while the passive virtue only is in the germ-cell; by what means does the action of the former (since it is an accident of the principal agent) terminate, though separated from this agent, in a substantial generation? Such are the questions which the Angel of the

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[1] 'Quandocunque enim duo sunt principia moventia vel agentia ad invicem ordinata, id quod in effectu est ab agente superiori, est sicut formale; quod vero est ab inferiori agente, est quasi materiale.' *Verit. Q.* xiv, *a.* 5, *c.*, *in med.*

[2] 'Ex actionibus qualitatum activarum consequitur anima sensibilis et aliae formae substantiales, secundum quod in eis ut instrumentis manet virtus animae vel alterius substantialis formae et ipsius caeli. Et ideo non oportet, cum non agant in virtute sua tantum, quod ex actionibus earum nihil sequatur ultra earum speciem; quia ex motu instrumenti sequitur effectus secundum rationem principalis agentis.' 2 *d.* xviii, *Q.* 2, *a.* 3, 2[m].

Schools shall solve for us; and it will be our endeavour to convince the reader, that here likewise the teaching of this great Doctor is in complete harmony with the latest discoveries in this interesting branch of physics. We begin, as usual, with setting forth his doctrine in his own words.

i. 'In perfect animals that are generated by sexual intercourse, the active principle is in the sperm-cell of the male, as the Philosopher declares in the first Book *De Generatione Animalium;* while the matter of the embryo is that which is supplied by the female. Now, straightway from the beginning' of the process of reproduction, 'there is in this matter a vegetative soul,—not, indeed, after the manner of a second but of a first act, like as a sensile soul exists in such as are asleep. But when it begins to attract to itself food, then at once it is in active operation. The said matter, then, is transformed by means of the virtue existing in the sperm-cell of the male, until it is promoted to the act' or form 'of a sensile soul. Not that the identical virtue which was in the sperm-cell becomes a living soul; because in that case the generator and the generated would be one and the same thing; and this would be more like nutrition and growth than generation, as the Philosopher says in his first Book *De Generatione et Corruptione.* Now, after that a sensile soul, by virtue of the active principiant which was in the sperm-cell, has been produced in the embryo as regards some principal part; then at once the said sensile soul of the embryo sets to work towards completing its body by means of nutrition and growth. But the active virtue which was in the sperm-cell ceases to exist with the dissolution of the sperm-cell and with the evanescence of the vital spirit that was in it. Nor is this unsuitable; because the aforesaid force is not the principal, but the instrumental agent. Now, the motion of an instrument ceases, so soon as the effect has been produced in being[1].'

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[1] 'In animalibus perfectis, quae generantur ex coitu, virtus activa est in semine maris, secundum Philosophum in lib. 1 de Generat. Animal. cap. 2 et 20; materia autem foetus est illud quod ministratur a femina: in qua quidem materia statim a principio est anima vegetabilis, non quidem secundum actum secundum, sed secundum actum primum, sicut anima sensitiva est in dormientibus; cum autem incipit attrahere alimentum, tunc jam actu operatur. Hujusmodi igitur materia transmutatur a virtute quae est in semine maris, quousque perducatur in actum animae sensitivae; non ita quod ipsamet vis, quae erat in semine, fiat anima sensitiva, quia sic idem esset generans et generatum. Et hoc magis esset simile nutritioni et augmento

ii. 'That active virtue which is in the sperm-cell, derived from the soul of the generating parent, is as it were a sort of motion of the very soul of the parent. Neither is it the soul or portion of the soul, save virtually; just as in the saw or hatchet there is not the form of the bed, but a sort of motion towards such form. Wherefore, it is not necessary that the said active power should have any actual organ; but it is seated in the vital spirit itself included in the sperm-cell[1].'

iii. [2] 'Now, the sperm-cell after separation' from the principal agent, 'is not yet similar to the integral body actually, but in proximate potentiality. Wherefore, after separation from the soul it does not remain actually but potentially such. Accordingly, it is said in the second Book *De Anima*, that the sperm-cell has life potentially but not actually. Now, this potentiality is not passive in the sperm-cell, after the fashion that we call the wood and ashlars a house in potentiality; . . . but it is an active potentiality in some such sort, as we call the form of the house in the mind of the architect a house in potentiality. Hence, the Philosopher compares it to art; while Avicenna and Averrhoës call it the formative virtue. In its mode of operation, this virtue holds a middle place between the intellect and the other faculties of the soul. For the other faculties use determinate organs in their operations; while the said virtue uses

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quam generationi, ut Philosophus dicit lib. 1 de Gen. et Corrupt. Postquam autem per virtutem principii activi quod erat in semine, producta est anima sensitiva in generato quantum ad aliquam partem principalem, tunc jam illa anima sensitiva prolis incipit operari ad complementum proprii corporis per modum nutritionis et augmenti. Virtus autem activa quae erat in semine, esse desinit, dissoluto semine, et evanescente spiritu qui inerat. Nec hoc est inconveniens, quia vis ista non est principale agens, sed instrumentale; motio autem instrumenti cessat, effectu jam producto in esse.' 1^{ae} cxviii, 1, 4^{m}.

[1] 'Virtus illa activa quae est in semine, ex anima generantis derivata, est quasi quaedam motio ipsius animae generantis; nec est anima aut pars animae nisi in virtute; sicut in serra vel securi non est forma lecti, sed motio quaedam ad talem formam. Et ideo non oportet quod ista vis activa habeat aliquod organum in actu, sed fundatur in ipso spiritu incluso in semine.' *Ibid.* 3^{m}.

[2] 'Semen autem decisum nondum est actu simile toti, sed in potentia propinqua: et ideo non remanet post divisionem animae in actu, sed in potentia: propter quod dicitur 2 de Anima, quod semen in potentia vivit et non actu. Haec autem potentia non est passiva in semine maris, sicut dicimus ligna et lapides esse in potentia domus (sic enim est potentia in menstruo mulieris), sed est potentia activa, sicut dicimus formam domus in mente artificis esse potentia domum. Unde arti eam comparat Philosophus in 17 de Animalibus (seu de Gener. Animal. lib. 2, cap. 20); et hanc potentiam Avicenna et Commentator in 7 Metaphysic. vocant virtutem formativam: quae quidem virtus quantum ad modum operandi media est inter intellectum et

in some sort of a way a bodily organ that has no determinate species. Now, the Subject and organ of this virtue is the vital spirit included in the sperm-cell. . . . To this spirit, then, is united the formative virtue, after the manner of an agent of motion rather than of a form; though its form exists in a way. . . Now, to that corporeal vital spirit there is conjoined a threefold heat;—to wit, elemental heat, which is an instrument resolving and consuming and doing the like operations; and the heat of the soul, which is vivifying; and the heat of the heavens, in virtue of which the vital spirit causes motion towards a determinate species. By virtue of this threefold heat, the formative virtue transforms the matter that has been prepared by the female into the substance of the members, after the manner that there is a bodily transformation in growth; . . and according to the progress of the organs in perfectness, the soul, which was before in potentiality, begins to be more and more actual in the sperm-cell; so that the embryo first of all participates in the operations of the nutritive life, and for such time is said to live the life of a plant; and so on in succession, until it attains a complete likeness to the parent.'

iv. [1] 'You should know that the opinion of certain persons is false, who say that the vital operations which manifest themselves in embryo, previous to its arriving at its full development, do not the proceed from any soul or faculty of the soul existing in it, but from

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alias vires animae. Aliae enim vires utuntur in suis operationibus determinatis organis: intellectus autem nullo: haec autem utitur aliquo modo corporali in sua operatione quod nondum habet determinatam speciem. Subjectum autem et organum hujus virtutis est spiritus vitalis inclusus in semine; unde ad continendum hujusmodi spiritum semen est spumosum, et haec est causa albedinis ejus. Huic autem spiritui conjungitur virtus formativa, magis per modum motoris quam per modum formae, etsi forma ejus aliquo modo sit. Unde dicit Commentator in 7 Metaphys. quod includitur in semine virtus illa quodammodo sicut uniuntur motores orbibus. Illi autem corporali spiritui conjungitur triplex calor: scilicet calor elementaris, qui est sicut instrumentum resolvens et consumens et hujusmodi operans; et calor animae, qui est vivificans; et calor caeli cujus virtute movet ad speciem determinatam. Et virtute hujus triplicis caloris, virtus formativa convertit materiam a muliere praeparatam in substantiam membrorum per modum quo est transmutatio corporis in augmento, ut 15 de Animalibus dicitur. Et secundum quod proceditur in perfectione organorum, secundum hoc anima incipit magis ac magis actu esse in semine, quae prius erat in potentia: ita quod conceptum primo participat opera vitae nutritivae, et tunc dicitur vivere vita plantae; et sic deinceps, donec perveniat ad completam similitudinem generantis.' 2 *d.* xviii, *Q.* 2, *a.* 3, *c.*, *p. m.*

[1] 'Primo itaque sciendum est falsam esse opinionem quorumdam dicentium quod opera vitae, quae apparent in embryone ante ultimum complementum, non sunt ex aliqua anima vel virtute animae in eo existente, sed ex anima matris. Si enim hoc

the soul of the mother. For, if this were true, the embryo would at once cease to be an animal; since every animal consists of a soul and a body. Besides, vital operations do not proceed from an extrinsic vital principiant, but from an intrinsic faculty; whereby living things, one of whose properties is self-motion, are seen to be principally distinguished from things that are devoid of life. For that which is nourished assimilates to itself its nourishment. Hence, in that which is nourished there must necessarily be an active faculty of nourishing; since the agent causes that which is like itself. This is much more manifest in the operations of sense; for sight and hearing belong to an entity by reason of some faculty that is in itself, not in another. Accordingly, since it is ascertained that an embryo receives nourishment and has moreover sensile perception, previously to its full development; this cannot be attributed to the soul of the mother.

'Neither, on the other hand, can it be maintained that, from the very commencement, the soul in the completeness of its essence is in the sperm-cell, but that its operations do not manifest themselves by reason of a want of organs. For, since a soul is united to a body as a form; it is only united to the body of which it is properly the act. Now, a soul is the act of an organized body. Therefore, the soul is not in the sperm-cell actually, previous to the organization of the body, but only potentially and virtually. . . . If the soul were in the sperm-cell from the beginning, it would further follow that animal generation would be the result of separation; as takes place with annelides, so that from being one they become two. For, if

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esset verum, jam embryo non esset animal, cum omne animal ex anima et corpore constet. Operationes enim vitae non proveniunt a principio activo extrinseco, sed ab intranea virtute, in quo praecipue a non viventibus viventia videntur discerni, quorum est proprium movere seipsa. Quod enim nutritur assimilat sibi nutrimentum; unde oportet in nutrito esse virtutem nutritionis activam, cum agens sibi simile agat. Et multo est hoc manifestius in operibus sensus; nam videre et audire convenit alicui per virtutem aliquam in ipso existentem, non in alio. Unde cum embryo inveniatur nutriri ante ultimum complementum et etiam sentire, non potest hoc attribui animae matris.

'Nec tamen potest dici quod in semine, ab ipso principio, sit anima secundum suam essentiam completam, cujus tamen operationes non apparent propter organorum defectum. Nam cum anima uniatur corpori ut forma, non unitur nisi corpori cujus est proprie actus. Est autem anima actus corporis organici. Non est igitur ante organizationem corporis in semine anima actu, sed solum potentia sive virtute. . . . Sequeretur etiam, si a principio anima esset in semine, quod generatio animalis esset solum per decisionem, sicut est in animalibus annulosis, quod ex uno fiunt duo. Semen enim, si statim cum est decisum, animam haberet, jam haberet formam

the sperm-cell immediately on its liberation should have a soul; it would thereupon have a substantial form. Now, all substantial generation is previous to the substantial form, and does not come after it.' St. Thomas is here speaking of the essential organic constitution of the body from a physical point of view, and with special reference (as is evident from the preceding Chapters) to the soul of man. 'If, however, any changes come after the substantial form, they are not ordained to the being of the embryo, but to its well-being. . . . But it becomes still more ridiculous, if affirmed of a rational soul; because this latter cannot possibly be divided with the division of the body. . . .

'Neither, again, can it be maintained (as some do), that though, as soon as the sperm-cells are liberated, the soul is not in them actually but virtually in consequence of the want of organs; yet the same active power of the sperm-cell—a body capable of organization, though not organized actually—corresponds with the sperm-cell in being a soul potentially but not in act; and, seeing that the plant-life postulates fewer organs than animal life, and seeing that the sperm-cell at the outset is sufficiently organized for plant-life, that the aforesaid virtue'—the formative virtue in the sperm-cells—'becomes a vegetative soul: That afterwards, when the organs have become more complete and numerous, the same is evolved into a sensile soul: That, further, on the form of the organs becoming perfect, this same soul becomes intellectual,—not by the action of the virtue in the sperm-cell, but by the causal influx of an external agent; (which, as they conjecture, induced Aristotle to remark in his Work *De Generatione Animalium*,

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substantialem. Omnis autem generatio substantialis praecedit formam substantialem, non eam sequitur; si quae vero transmutationes formam substantialem sequuntur, non ordinantur ad esse generati, sed ad bene esse ipsius. . . . Sed adhuc magis est ridiculum, si hoc de anima rationali dicatur; tum quia impossibile est ut dividatur secundum divisionem corporis, ad hoc ut in deciso semine esse possit; tum quia sequeretur quod in omnibus pollutionibus ex quibus conceptus non sequitur, nihilominus rationales animae multiplicarentur.

'Neque etiam dici potest (quod quidam dicunt), etsi a principio decisionis in semine non sit anima actu sed virtute propter deficientiam organorum, tamen ipsammet virtutem seminis, quod est corpus organizabile, etsi non organizatum, esse proportionaliter semini animam in potentia, sed non actu; et, quia vita plantae pauciora requirit organa quam vita animalis, primo semine sufficienter ad vitam plantae organizato, ipsam praedictam virtutem fieri animam vegetabilem; deinde, organis magis perfectis et multiplicatis, eamdem perduci ut sit anima sensitiva; ulterius autem forma organorum perfecta, eamdem animam fieri rationalem, non quidem per actionem virtutis seminis, sed ex influxu superioris agentis, propter quod suspicantur

that the intellect comes from the outside). For it would follow from this contention, that an active energy numerically the same could be now only a vegetative soul and afterwards a sensile soul; and thus it would be possible for a substantial form to be constantly perfectioned more and more. It would further follow that the substantial form could be evolved out of potentiality into act, not all at once but successively; and, moreover, that generation could be a continuous motion like alteration. All this is naturally impossible. . . .

'Wherefore, the said virtue (which is liberated together with the sperm-cell, and goes by the name of the formative virtue) is not in the soul, neither does it become the soul in the process of generation. Since, however, it is seated in the vital spirits, contained in the sperm-cell, as in its proper Subject, . . it effectuates the formation of the body, as acting by the strength of the soul of the father to whom, as to the principal agent, generation is attributed; not by the strength of the soul of the embryo, even after the soul is there. For an embryo does not generate itself, but is generated by the father. This is made clear, if we consider one by one each of the faculties of the soul. For it cannot be attributed to the soul of the embryo in virtue of its *generative* faculty; both because the generative faculty does not attain to its operation, till the office of the faculties of nourishment and growth (which are both subservient to it) is completed,—since to generate is proper to that which has reached its perfection,—as also because the office of the generative faculty is not ordained for the per-

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Aristotelem dixisse (de Generat. Anim.) intellectum ab extrinseco esse. Secundum enim hanc positionem sequeretur quod aliqua virtus eadem numero nunc esset anima vegetabilis tantum, et postmodum anima sensitiva, et sic ipsa forma substantialis continue magis ac magis perficeretur; et ulterius sequeretur quod non simul, sed successive, educeretur forma substantialis de potentia in actum, et ulterius quod generatio esset motus continuus, sicut et alteratio; quae omnia sunt impossibilia in natura. . . .

'Non igitur ipsamet virtus quae cum semine deciditur et dicitur formativa, est anima neque in processu generationis fit anima; sed cum ipsa fundetur, sicut in proprio subjecto, in spiritu cujus est semen contentivum sicut quoddam spumosum, operatur formationem corporis, prout agit ex vi animae patris cui attribuitur generatio sicut principali generanti, non ex vi animae concepti, etiam postquam anima inest; non enim conceptum generat seipsum, sed generatur a patre. Et hoc patet discurrenti per singulas virtutes animae. Non enim potest attribui animae embryonis ratione virtutis generativae: tum quia vis generativa non habet suam operationem nisi completo opere nutritivae et augmentativae quae ei deserviunt, cum generare sit jam perfecti; tum quia opus generativae non ordinatur ad perfectionem ipsius

fectioning of the individual, but for the preservation of the species. Neither, again, can it be attributed to the faculty of *nutrition*, whose office is to assimilate the nourishment to the entity that is nourished. But there is no appearance of this in the present instance. For the nourishment, in the process of the formation of the embryo, is not reduced to the likeness of something pre-existing,' (since according to the hypothesis the embryo does not as yet exist in its specific nature); 'but is developed to a form more perfect and nearer in likeness to the father. In like manner, it cannot be attributed to the faculty of *growth*, which has nothing to do with a change in the form, but only in quantity. As for the *sensitive* and *intellectual* faculties, it is plain that these have no function fitted for such formation. It remains, then, that the formation of the body—more particularly of its primary and principal parts—is not the effect of the soul of the embryo or of the formative virtue as acting by its own energy, but as acting in the strength of the generating soul of the father, whose function it is to produce that which is a likeness to the parent in its specific nature. Accordingly, this formative power remains the same in the aforesaid vital spirits from the commencement until the formation is concluded. But the specific nature of the embryo that is formed does not remain the same. For at first it bears the form of a sperm-cell, afterwards of blood, and so on, till it arrives at its final completeness. For, though the generation of the simple bodies does not proceed according to any order' of generations, 'because each one of them possesses a form that actuates primordial matter without an intermediate; nevertheless, in the generation

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individui, sed ad speciei conservationem. Nec etiam potest attribui virtuti nutritivae, cujus opus est assimilare nutrimentum nutrito, quod hic non apparet; non enim nutrimentum in processu formationis trahitur in similitudinem praeexistentis, sed perducitur ad perfectiorem formam et viciniorem similitudini patris. Similiter nec augmentativae, ad quam non pertinet mutatio secundum formam, sed solum secundum quantitatem. De sensitiva autem et intellectiva patet quod non habent aliquod opus formationi tali appropriatum. Relinquitur igitur quod formatio corporis praecipue quantum ad primas et principales partes, non est ab anima genita, nec a virtute formativa agente ex vi ejus, sed agente ex vi animae generativae patris, cujus opus est facere simile generanti secundum speciem. Haec igitur vis formativa eadem manet in spiritu praedicto, a principio formationis usque in finem; species tamen formati non manet eadem; nam primo habet formam seminis, postea sanguinis, et sic inde quousque veniat ad ultimum complementum. Licet enim generatio simplicium corporum non procedat secundum ordinem, eo quod quodlibet eorum habet formam immediatam materiae primae, in generatione tamen corporum aliorum oportet esse generationum ordinem, propter multas formas intermedias inter primam formam

of other bodies it is necessary that there should be an ordered succession of generations, because of the numerous intermediate forms between the primordial form of the element and the ultimate form to which the generation is ordained. Accordingly, there are many generations and many corruptions succeeding one another.

'Nor is there anything inconsistent, if any one of the intermediates is generated and straightway afterwards is broken in upon; because intermediates do not possess a complete specific nature, but are, as it were, a road towards a specific nature. Wherefore, they are not generated for the purpose of remaining; but in order that by their means the ultimate embryo may be reached.'

v. The following passage is usefully illustrative of the first paragraph in the preceding quotation, touching the part the mother was by some supposed to play in the vital functions of the foetus:

'Others say that the embryo has no soul,'—a human embryo,—'till it is perfected by a rational soul, and that the vital operations which are apparent in it proceed from the soul of the mother. But this cannot be. For living things are distinguished from those which are destitute of life in this,—that living things exercise a spontaneity of movement in their vital operations, which cannot be affirmed of things that are destitute of life. Wherefore, it is impossible that the acts of nutrition and growth, which are operations proper to a living thing, should in the embryo be derived from an extrinsic principiant,—that is to say, from the soul of the mother. Besides the nutritive faculty of the mother would assimilate its food to the body of the mother, and not to the body of the embryo; since the nutritive faculty subserves the individual, as the generative subserves the species. In addition, sensation in the embryo cannot be derived from the soul of the mother[1].'

vi. Under this last Number several passages are strung together,

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elementi et ultimam formam ad quam generatio ordinatur: et ideo sunt multae generationes et corruptiones sese consequentes.

'Nec est inconveniens si aliquid intermediorum generatur, et statim postmodum interrumpitur; quia intermedia non habent speciem completam, sed sunt ut via ad speciem; et ideo non generantur ut permaneant, sed ut per ea ad ultimum generatum perveniatur.' *Cg. L.* ii, *c°.* 89.

[1] 'Alii vero dicunt, quod embrio non habet animam, quousque perficiatur anima rationali: operationes autem vitae quae in eo apparent, sunt ex anima matris. Sed hoc non potest esse: nam in hoc viventia a non viventibus differunt, quia viventia movent seipsa secundum operationes vitae, quod de non viventibus dici non potest. Unde non potest esse quod nutriri et augeri, quae sunt propriae operationes viventis, sint in embrione a principio extrinseco, scilicet ab anima matris. Et praeterea

bearing on the manner of causality in animal reproduction. They are as follows:

a. 'The active virtue which is in the human sperm-cell, attracting to itself the matter derived from the mother, operates by means of the vital spirits; for this virtue is seated in the vital spirits[1].'

b. 'It is an arrangement of nature, that in animal generation the female should provide the matter; but that the active principiant in generation should attach to the male, as the Philosopher proves in the nineteenth Chapter of the first Book *De Generatione Animalium*[2].'

c. 'Touching the matter out of which the human body is formed, there are different opinions. For some say that the human body is formed out of a fusion of the sperm-cell and germ-cell. . . But this opinion the Philosopher demolishes in a variety of ways; since by argument as well as by facts perceptible to the senses,—which are the most powerful motives of assent in things physical,—he shows that what proceeds from the male is not the material of the human body, but only an active principiant. This is plainly seen upon an examination of his statements[3].'

d. 'The sperm-cell of the male, in all animal generation whatsoever, attracts to itself the matter provided by the mother; as though the virtue which is in the sperm-cell intends its complete evolution as end of the entire generation. Accordingly, as soon as the generation is completed; the sperm-cell itself, transmuted and perfected, is the offspring that is born[4].'

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virtus nutritiva matris assimilaret cibum corpori matris, et non corpori embrionis; cum nutritiva deserviat individuo, sicut generativa speciei. Et iterum sentire non posset esse in embrione ex anima matris.' *Po*^{a}. *Q*. iii, *a*. 9, 9^{m}. *v*. *f*.

[1] 'Virtus enim activa quae est in semine humano, ad se trahens materiam quae fuerit a matre, per spiritum operatur; fundatur enim hujusmodi virtus in spiritu.' *Cg*. *L*. iv, *c*^{o}. 46.

[2] 'Habet autem hoc naturalis conditio, quod in generatione animalis femina materiam ministret, ex parte autem maris sit principium activum in generatione, sicut probat Philosophus in lib. 1 de Generatione Animalium, cap. 19, in fin.' 3^{ae} xxxi, 5, *c*.

[3] 'Circa materiam de qua corpus hominis formatum est, variae sunt opiniones. Quidam enim dicunt quod corpus humanum formatur ex commixtione seminum, scilicet matris et patris simul, cum sanguine menstruo: ita quod totum hoc sit materia corporis. Hoc autem Philosophus in 15 de Animalibus multipliciter destruit, ostendens, quod id quod ex viro descendit, non est materia humani corporis, sed solum principium activum, et per rationem, et experimenta sensibilia, quae magis in rebus naturalibus faciunt fidem: et hoc patet inspicienti verba ejus.' 3 *d*. iii, *Q*. 5, *a*. 1, *c*.

[4] 'Semen maris in generatione animalis cujuscumque trahit ad se materiam quam

e. 'The sperm-cell of the male does not enter materially,'—that is to say, as part of the matter,—'into the constitution of the embryo, but is only the active principiant; while the whole of the matter is provided by the mother[1].'

f. 'The formative virtue, which at the beginning is in the sperm-cell, remains even after the advent of the rational soul; as remain likewise the vital spirits, into which the whole substance of the sperm-cell is converted. That, then, which was previously formative of the body, becomes afterwards regulative of the body[2].'

On the strength of these quotations, let us now proceed to reduce the teaching of St. Thomas touching the reproduction of the higher grades of animal life to orderly expression, for the purpose not only of inquiring somewhat more definitely into the nature of the causality of accidents in the generation of living substances, but likewise of comparing the Scholastic doctrine with the latest discoveries of modern embryology. The subject divides itself into four principal questions, the first of which embraces the sperm-cell; the second, the germ-cell; the third, the process of generation; the last, the embryo.

1. To begin with the teaching of the Angelic Doctor concerning the sperm-cell: By way of prelude, let us recall to mind a fact upon which St. Thomas repeatedly insists in the above quotations,—viz. that the soul of the male—his substantial form—is the sole *principal* Efficient Cause among finite causes. Hence, St. Thomas, in a passage not included in the collection just given, makes the following emphatic declaration: 'In carnal generation,'—as distinguished from spiritual which is the professed subject of discussion in the Article,—'male and female operate in accordance with the faculty of their proper nature. Wherefore, the female cannot be the active, but only the passive principiant of generation[3].' It is natural,

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mater ministrat, quasi virtus quae est in semine maris intendat sui ipsius complementum ut finem totius generationis; unde et, completa generatione, ipsum semen immutatum et completum est proles quae nascitur.' *Cg. L.* iv, *c*°. 45.

[1] 'Semen maris non intrat materialiter in constitutionem concepti, sed est solum activum principium; materia vero corporis tota ministratur a matre.' *Ibidem.*

[2] 'Virtus formativa quae in principio est in semine, manet adveniente etiam anima rationali; sicut et spiritus in quos fere tota substantia spermatis convertitur manent. Et illa quae prius fuit formativa corporis fit postmodum corporis regitiva.' *Po*ª. *Q.* iii, *a.* 9, 16ᵐ.

[3] 'In generatione carnali masculus et femina operantur secundum virtutem propriae naturae; et ideo femina non potest esse principium generationis activum, sed passivum tantum.' 3ªᵉ lxvii, 4, 3ᵐ; *cf.* xxxii, 4, *c.*

therefore, to conclude that the same distinction will be found to exist, when we come to examine into the immediate action of the instrumental cause; and thus we are introduced to the question to which the present paragraph is devoted. The sperm-cell, then, is the proximate and, as it were, *material* instrument of the substantial cause of the male. Accordingly, it is not the adequate instrument; unless we take it together with all its belongings. Thus considered, it and it alone is the instrumental cause of animal reproduction. The germ-cell has no generative activity; it is purely receptive. But in what way or by what means does the sperm-cell execute its office of fecundation and generation? As we have seen, St. Thomas tells us that it does so in virtue of the motion and efficacy given to it by the substantial form, or vital principle, of the father. But how can this be so, seeing that, at the time of its conjugation with the germ-cell, it is physically separated from the principal agent? It is one of those instrumental causes which, according to the same Doctor, receive a sort of impress or form from the principal agent, in virtue of which they are able, though in a state of isolation, to produce the effect intrusted to them. But of what nature is this sort of impress or form; for the naked expression does not suggest any clear or definite idea? St. Thomas answers as follows: The sperm-cell acts by means of the formative virtue, contained in the vital spirits that have circulated from the heart of the father and have charged the sperm-cell. Has the sperm-cell, then, life after its liberation? St. Thomas replies that it has life potentially, but not actually. The plain reason is, that its own substantial form (such as it has) is not a living form. In what sense, then, has it life potentially? St. Thomas answers, that it is not a passive potentiality like that which there is in beams, bricks, and ashlars to become a house; but an active and directive potentiality, like that which the plans of an architect have to become a house. It is filled with a communicated vitality. Its potentiality is the formative virtue contained in the vital spirits. These vital spirits, diffused throughout the body of all living animals, but in greater abundance throughout the sperm-cells, may probably be one of those active qualities (seminales rationes), bestowed on bodies subsequently to the creation of the elements. One word more about these sperm-cells. They are not organized, but capable of organization. Hence, as St. Thomas remarks, the formative virtue holds a place midway between the intellect and

the other faculties of the human soul. For the intellect requires no organ; the vegetative and sensile faculties postulate and possess a determinate organ; the formative virtue requires, and is provided with, a bodily entity without any definite organism, because it is equally potential of all the organs of the body.

Now, how does this teaching of St. Thomas agree with modern discoveries in embryology? There is one physical fact connected with living reproduction by sexual conjugation, whether vegetative or animal; and it is this. The sperm-cell always travels out of doors in search of the germ-cell; while this latter, as an ordinary rule, remains at home, awaiting the arrival of its fertilizing partner. It is true that the ovum may pass from one room to another; but it does not quit the premises. Of course, it is needless to say that there are certain few exceptions, as in the instance of cold-blooded fish; but even here the ova passively await their conjugation with the milt. They are acted upon. All this looks very much like giving and taking,—or what the Scholastic would call an active, and correlative passive, potentiality. Again: The sperm-cell is endowed with a remarkable amount of activity, which finds no counterpart in the germ-cell. Yet motion is indicative of activity. Again: 'On the whole,' writes Professor Haeckel, 'the egg-cell is one of the largest of cells. In nearly all animals it is larger than any of the other cells. On the other hand, the other cell which plays a part in impregnation, the male sperm-cell, is one of the smallest cells of the animal body[1].' But bulk is usually significative of the relative materialism and passivity of an entity. Illustrative of this is another fact, well known to those who have had anything practically to do with the artificial breeding of salmon, trout, etc. A very small discharge of milt is enough to fertilize some thousand eggs; and it is necessary to change the water once or twice during the fertilizing operation, in order to prevent the milt 'from being too strong.' These facts are confirmed by parallel phenomena in vegetative life. 'Wherever there is an evident external difference,' writes Professor Sachs, 'between the two sexual cells, one behaves actively in the union, and loses' (to outward seeming) 'in the process its individual existence, the other behaves passively, absorbing into itself the substance' (matter) 'of the active one, and furnishing by far the

[1] *Evolution of Man, ch.* vii, *V.* 1, *p.* 171 (*E. Tr.*)

greater proportion of the first materials for the formation of the immediate product of the union. The former is termed the *male* or *sperm-cell*, the latter the *female* or *germ-cell* or *oosphere*[1].' So again in another place: 'That one of the two sexual cells which performs active work and itself disappears after fertilization is the *Male* or *Sperm-cell* (spermatozoid, antherozoid, pollen-grain); the one which is acted upon by the former and becomes transformed into an Embryo which begins the new generation is the *Female* or *Germ-cell* (ovum, oosphere, germinal-vesicle)[2].' Certain modern theories offer an apparent difficulty to the explanation of the Angelic Doctor in part; but these will be considered under the third head.

Let us now in turn consider the constitution of the sperm-cell in its character of instrumental cause, as explained by St. Thomas; and compare it in like manner with what we learn from modern physiology. The instruments of the formative virtue are the vital spirits that are everywhere diffused through the sperm-cell, and are derived from the principiant of life in the father. Surely, such teaching harmonizes with what we are now told concerning the mobility of these cells, of protoplasm in general, and of the phenomena observable in the blood just taken from the veins, as revealed to microscopic observation. The sperm-cell, when isolated, does not possess *actual* life, says St. Thomas; though it has the active potentiality of life. 'It was a very long time,' writes Professor Haeckel, 'before it was discovered that these structures are simple cells. In former times they were universally regarded as actual animals, and were called sperm-animals (*Spermatozoa*). It is only through the searching investigations of the past few years that we have acquired positive evidence of the fact that each of these so-called spermatozoa is really a simple cell. It is better therefore to call them simply seed-cells or sperm-cells[3].' St. Thomas tells us that these sperm-cells are unorganized,—that is to say, unprovided with special and differentiated organs. Professor Haeckel observes, in connection with this point: 'In the earlier expositions of the subject a head, trunk, and tail were distinguished in each one of these "seminal animalcules." The

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[1] *Text-Book of Botany, B.* ii, *ch.* 6, § 30, *p.* 802 (*E. Tr.*)
[2] *Ibidem, B.* i, *ch.* 3, § 29, *p.* 203.
[3] *Evolution of Man, ch.* vii, *V.* 1, *p.* 172.

so-called "head" is only the longish round or oval nucleus; the body, the central portion, is only an aggregation of cell-material, a prolongation of which forms the tail[1].' 'The contents of the ripe pollen-grain, the *Fovilla* of the older botanists,' writes Professor Sachs concerning the pollen of angiosperms, 'usually consists of a dense coarse-grained protoplasm, in which grains of starch and drops of oil may be recognized[2].'

2. Of the germ-cell (for so we must call it in accordance with modern terminology) St. Thomas has little to say beyond that which has been already stated above,—viz. that it has no formative activity, but is purely receptive. Such a description, however, must not be misunderstood. It is not to be imagined for a moment, that the Angelic Doctor meant to represent the germ-cell as destitute of all vital activity in itself, or as not participating after its measure in the vital spirits which permeate more or less the whole body of the animal. He is speaking exclusively of the process of reproduction; and he asserts that in it the germ-cell plays a purely passive part, like timber and stones in the construction of a building. It has no formative virtue, but supplies the material. This will come before us again in the ensuing paragraph.

3. By far the most important question is that which embraces the *process* of reproduction. According to St. Thomas, then, as soon as the sperm-cell has completely conjugated with the germ-cell, it begins to attract towards itself the contents of the latter as being the destined material of transformation. No sooner has the conjugation, by which the germ-cell is fertilized, taken place, than the sperm-cell is informed by a provisional vegetative soul,—or rather, the whole conjugate; though the act is formally with the sperm-cell. But this form is at first asleep;—in its first act of being, not as yet in its second act of natural operation. Cellular changes then succeed; and organs sufficient for the exercise of the vegetative life are gradually formed by the formative virtue that abides in the sperm-cell, and as a consequence in what, consonantly with modern ideas, may be called the parent-cell,—the cytula of Professor Haeckel. As soon as the organs of vegetative life have been sufficiently developed by the formative virtue in the

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[1] *Evolution of Man, ch.* vii. *V.* 1, *p.* 174.
[2] *Text-Book of Botany, B.* ii, *Class* 11, *pp.* 486, 487.

vital spirits; the young embryo begins to make use of the functions of nourishment and growth. With the aid of this vegetative form the same formative virtue carries on the differentiation and perfectioning of the organism; until the parent-cell—or rather its plant-development—postulates in conformity with its higher organism a sensile or animal soul, and becomes actuated by such a form. The embryo, thus transformed, then begins to function by the help of such organs as have been made ready to its use. But, —since we are in a special manner considering human generation in company with St. Thomas,—not yet is the work of the formative virtue in the vital spirits complete. It continues to develope and perfect the organism; till a fitting body has been prepared for the reception of the human soul which is created by God to inform it. Here we stop for the present, in order to introduce some further observations touching this complex process, without which the statement of the teaching of the Angelic Doctor would be incomplete.

a. It follows from the doctrine here set forth, that, in the process of reproduction, that which eventually becomes a human embryo passes through a series of generations and corruptions, before arriving at its complete development. This statement has been already *ex professo* defended in the *hundred and ninety-fourth* Proposition; but there are further points to be added, which are more particularly connected with the Efficient Causality. It is important, then, to notice that the series of temporary generations must not be considered as exhausted in the brief and general description given: for it is plainly the opinion of St. Thomas that, within the respective orders of vegetative as of animal life, there are many successive forms mounting higher and higher in the scale of each order, in proportion to the evolution of a convenient organism. It will be necessary likewise to repeat a remark made more than once before,—but its importance will justify its repetition,—that all these intermediate forms, including the primordial one in the series, are merely provisional. They are a road, not the terminus. Accordingly, they do not constitute a substantial entity according to a definite species, as they would do if their eduction were the term of generation. The human embryo is never a real plant or a real irrational animal in the strict meaning of these terms. On the contrary, the formative virtue received in the sperm-cell from the substantial form of the father as principiant of life, which is

actively present during the whole process, is master of the situation throughout. It is ever pushing on towards the typal nature which is the term of its energy. Consequently, the human embryo will never exhibit itself as a real invertebrate, or a fish, or a monkey, capable of classification; though it passes through the invertebrate and vertebrate stages, as it were, *generically,* and under each may assume a variety of provisional and progressive forms. The same may be said (supposing that there are such, which probably there are) of the various stages of its vegetative life. Of course, in the generation of plants and of irrational animals there is a similar series of generations and corruptions, proportioned to the perfectness of type of each respectively.

b. St. Thomas makes another remark of no little importance. He warns us against the error of supposing that, as the parent-cell is gradually transformed into a highly organized body, so the formative virtue in the sperm-cell is metamorphosed into these vegetative and animal forms. First of all, such a hypothesis makes the generating agent and the thing generated one and the same entity, which means that a thing could generate itself. (This argument appears in the first quotation.) Then, in the next place, it supposes that 'a virtue numerically the same'—one and the same individual power—could be a vegetative soul and then afterwards an animal soul; and thus substantial forms would be capable of being *specifically* perfectioned,—in other words, developed into a variety of specific natures. Thirdly, in such a hypothesis a substantial form could be evolved out of the potentiality of the matter by successive stages, like accidental forms. Lastly, in such case generation would be a continuous motion like alterations, not an instantaneous *act.* (These last three reasons are to be seen in the fourth quotation.) It cannot be too thoroughly realized, that the formative virtue is purely an instrumental cause; and that, as such, it can have no place whatsoever as an intrinsic cause of the embryo.

c. Yet another observation of equal importance has been made by the Angelic Doctor. The preceding forms in the series of progressive evolution have nothing to do with the eduction of the higher forms that succeed them. Their mediate action is limited to the developing and perfecting that organism, which is within the limits of their own capacity and is subservient to their own natural functions. This doctrine will be greatly illustrated

by introducing a theory which St. Thomas only mentions to condemn. Some philosophers of the earlier times had maintained, that the ultimate form was present in the embryo and actuated it from the first moment of its conception; but that its faculties lay dormant, till they were possessed of the several organs necessary to their operation. In other words, these philosophers contended that from the first moments of passive conception the perfect embryo is in its first act, though not as yet in its second. To this view St. Thomas opposes a decided negative. For, as he justly urges, a soul is the act of an organized body,—that is to say, of a body possessed of the organs necessary for the natural operation of the substantial form. Some animals have naturally fewer sensile faculties, for example, some more but not all, others all; none are without the sense of touch. In each case, the body must be provided with the organs necessary for the senses belonging to the destined form, before it can be actuated by such form; otherwise, the form would not be *the act of a duly organized body*. Hence, an embryo that has only organs of nutrition and growth, cannot have an animal form; and an animal embryo that only has organs adapted to the sense of touch, cannot as yet possess the substantial form of a higher order of sensile life. Accordingly, with each stage of development in the organism there is a fresh generation and a concomitant corruption. A higher form supervenes; and the previous inferior form recedes into the potentiality of the matter. To apply this to the question in hand: The provisional form of the moment perfects the body within the limits of its own grade; but of itself it can go no further.

d. St. Thomas makes yet one other observation of no little interest. In opposition to certain physicists of his day, he demonstrates that the operations of nourishment and growth in the embryo are not attributable to the soul of the mother, but are the result of corresponding faculties belonging to the embryo itself, which therefore is possessed of at least vegetative life. This he establishes by three arguments. First: If the embryo did not nourish itself, it would not be a living animal. Secondly: No vital operations proceed from an extrinsic cause; since they are essentially spontaneous. (These two arguments are to be found in the fourth quotation.) Lastly: The nutritive faculty assimilates the food to the body of that individual to which it belongs. Hence, the mother would nourish her own body by her own nutritive

processes, not the body of her offspring. (This argument is to be found in the fifth quotation.) St. Thomas confirms this last conclusion by a profound remark, which may be thus paraphrased. The material cause in bodily substance has more especially to do with the haecceity, or individuality, of the entity, as has been explained in the third Book; while the formal cause exclusively determines the specific nature. Since, then, the faculty of nourishment concerns itself with the matter, and the generative faculty with the form; the first is more closely allied with the individual, the second with the specific nature. Hence, the faculty of nourishment is terminated to an effect intrinsic in, the generative faculty to an effect extrinsic to, its possessor; because the final cause of the one is the conservation of the individual, of the other the propagation of the species.

Now let us compare the teaching of the Angelic Doctor with the most recent discoveries in physiology, and with the inferences which modern physicists have drawn from these facts. Do these experimentally confirm that which may be called the fundamental position of St. Thomas, that the active principle in vital generation exists in the male sperm-cell, and that the material is supplied by the female germ-cell? For it behoves us ever to bear in mind the golden words of St. Thomas, given under *c.* of the sixth quotation,—'*experimental facts perceptible by the senses are the most powerful motive of assent in things of nature.*'

To begin with plants: We have already seen that Professor Sachs has pronounced the sperm-cell to be that 'which performs active work;' while the germ-cell is 'the one which is acted on by the former and becomes transformed into an Embryo.' In the same place he makes the additional remark: 'While the asexual reproductive cells usually become detached from the mother-plant and dispersed (hence called spores) in order to produce the new generation at a distance from it, the germ-cell, on the contrary, generally continues to lie in a special organ of the mother-plant (the oogonium, archegonium, ovule), there awaits fertilization, and afterwards still nourished by the mother-plant, commences the new process of vegetation (formation of embryo)[1].' The same authority, in treating of the angiosperms and referring to their manner of fertilization, (common—so far as the present inquiry is concerned—to all

[1] *Text-Book of Botany, B.* i, *ch.* 3, § 29, *p.* 203.

phanerogams), naturally introduces the pollen-tube,—a sort of canal which the sperm-cell projects, on its contact with the stigma, in order to reach the embryo-sac. He then proceeds as follows: 'The contact of the pollen-tube with the apex of the embryo-sac, or with the filiform apparatus of the embryonic vesicles, is sufficient for the transmission of the *fertilizing substance*[1].' This last expression has a marked significance; and we shall have to return to it presently. It suffices here to remark, that it evidently implies the activity of the pollen, or sperm-cell, and the receptivity of the ovule. The reproduction of plants has been introduced anew to the reader's notice, as affording a weighty argument from analogy.

But let us now proceed to consider the phenomena of reproduction in the higher grades of animal life. The phenomena in the initial stage of fertilization seem to be common to plant and animal. It is, first of all, noticeable that the ovum all but unexceptionally is provided with food-yolk; in the sperm-cell there is nothing to correspond with this. No sooner has the so-called head (the nucleus) of the sperm-cell penetrated into the egg, than it forms what Dr. Balfour has designated the *male pronucleus*; that is to say, it gathers towards itself the protoplasm of the egg that is near it, which begins to radiate round it. There is in the material of the egg at the same time a female pronucleus,—indigenous to the egg,—round which the protoplasm had originally radiated. On the arrival of the male pronucleus this radiation ceases; and the female pronucleus in its isolation passively awaits the action of its new partner. Soon the rays of the male pronucleus reach it, and at once awake it into activity; so that it hastens forward towards the male pronucleus. As it advances, the latter sends out 'protoplasmic processes,' which surround it; and at length a seeming fusion of the two cells takes place. Meanwhile, the so-called tail of the sperm-cell becomes metamorphosed, and eventually disappears within the ovum. Here, then, let us pause awhile. The facts, so far as we have gone, are obviously with St. Thomas. On the part of the germ-cell we find provision of material for the embryo, a corresponding size of shell, immobility[2], a passive indifference broken in upon by the

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[1] *Text-Book of Botany, B.* ii, *p.* 501. The last words are not italicized in the Work.

[2] 'The germ-cell (or its equivalent the ascogonium) is never actively mobile, even when, as in the Fucaceae, it is expelled and set in rotation by the attached spermatozoids; it usually remains enclosed in the mother-cell that produces it, . . . where it awaits fertilization by the male cell.' *Ibidem, B.* iii, *ch.* 6, *p.* 803.

active radiation of the energetic sperm-cell. On the part of this latter, contrariwise, a fierce activity is exhibited, from the moment of its first attempt to work its way into the egg up to the time of the conjunction of the two pronucleal cells. But here we are confronted with certain modern theories, professing to deal with these facts, which seem to oppose themselves to the teaching of Aristotle and of the Angelic Doctor. The eminent embryologist, Dr. Balfour, concludes from the phenomena just recorded, (which have been all but entirely borrowed from his learned Work on the subject), that 'the phenomenon which has just been described consists essentially in the fusion of the male cell and the female cell. In this act the protoplasm of the two cells as well as their nuclei coalesce, since the whole spermatozoon which has been absorbed into the ovum is a cell of which the head is the nucleus[1].' An observation or two is suggested by this passage. There is what looks like a vagueness and even incompatibility in the two terms, *absorb* and *coalesce*, as applied to the facts. Then, if of one of the two cells absorption must be predicated; it would surely be applied with more show of justice to the cell that is irresistibly acted upon by the energy of the latter. Again: 'The sexual process, which occurs in every known Metazoon, consists essentially, as is shown in the second Chapter of this work, in the fusion of two cells, viz. the female cell or ovum, and the male cell or spermatozoon, and of the subsequent division of the compound cell so produced into a number of parts which build themselves up into an organism resembling one of the parents. . . . The above considerations with reference to the male and female cells appear to indicate that they were primitively homodynamous, a conclusion which is on the whole borne out by the history of their development[2].' Now, is it complete to restrict the essential nature of 'the sexual process,'—even from a purely physical point of view,—to the 'fusion' and subsequent segmentation? Is not the penetration of the ovum by the sperm-cell the starting point, and the action of the male pronucleus, on the protoplasm that surrounds it and on the female pronucleus, an essential element in the fertilizing act? Whereas, the 'fusion' is a subsequent corruption preparatory to the work of generation, and the segmentation is this work in its beginnings. But what is that power or force

[1] *Comparative Embryology, ch.* ii, *V.* 1, *p.* 66.
[2] *Ibidem, Introduction, V.* 1. *pp.* 7, 9.

that is busily evolving order of symmetry out of chaos? Point out the Efficient Cause; and the process will no longer be an enigma. The passage, upon which these remarks are a comment, is moreover obscure, owing to a certain ambiguity in some of the terms. '*A compound cell*' may either mean a sort of bicellular cell, or it may mean a cell (so called) which exclusively consists in the combined protoplasm of two previous cells. It is in this latter sense that the author has apparently used the term. So again, '*homodynamous*' is an amphibological term. It may mean that the cells have the power of reproduction only in their conjugation; and this is true. Or it may mean that each originally had, in and by itself, an equal power of reproduction. It can hardly be doubted that this latter is the meaning intended by the author in the passage quoted; and if so, the assertion is not justified by the facts alleged in its support, and is a mere corollary from that peculiar theory of the self-evolution and self-differentiation of matter, which happens to find favour for the time being. It is a great misfortune to those of us who are mere learners, that in modern physical Works, even in those of the most competent and ablest authorities, we must submit to receive our facts through the colouring medium of a preconceived, and often baseless theory. Even in Dr. Balfour's otherwise admirable Work on *Comparative Embryology*, the experimental phenomena are made occasionally to subserve the interests of the aforesaid theory, by their being located (so to say) and interpreted according to the view of a spontaneous development of sexual from asexual reproduction. No one, of course, would dream of imputing to such distinguished writers the literary crime of consciously accommodating their facts to their pet theory; but there is still the danger of unconsciously violating the natural symmetry of facts, in order to satisfy the claims of a foregone conviction. Why cannot we have the simple facts of experience and observation, without being persecuted at every turn with a *view*? Facts are able to take care of themselves; and it is facts we want. One more observation on the conclusion quoted from Dr. Balfour, and we can pass on: Does the statement, that the parts 'build themselves up into an organism resembling *one* of the parents' harmonize with the opinion that the two cells are homodynamous?

The author of the Article on *Embryology* in the new edition of the *Encyclopædia Britannica* makes the following statement: 'In all ova the first stage of the formative process, following upon

fecundation of the germ, consists in the multiplication of the egg or germ-cell by a process of fissiparous division, so that when this division has proceeded some length, it results in the production of a mass or congeries of organized cells, descended from that which formed the primitive germ, and containing in combination the molecular elements of the materials contributed by the male and female parents to the formation of the fertilized germ.' It may well be doubted whether the segmentation of the cytula is of the nature of *fissiparous* division, if Professor Owen's explanation of this term is to be accepted; and it may perhaps be permitted to erase the words, *molecular elements*, as introducing a controverted theory in the place of facts.

We gather, then, from these authorities, that in the process of reproduction there are two cells, differing in form, size, mobility, origin, (we are alluding more particularly to the generation of the higher orders of animals), which in some way or other unite and become one body. Is this union the result of a coalition of the two, or of the absorption of the one by the other? If the latter, which of the two is absorbed, which absorbs? The bare facts teach us that after impregnation there is but one unnucleated body; consequently, there is no mere cellular coalition in which the distinction between the two is preserved. Therefore, the union must be somehow effected by process of absorption. But what does absorption mean? All that the facts of observation teach us is, that the sperm-cell with its nucleus or pronucleus seems to disappear in the protoplasm of the germ-cell. But then the pronucleus of the germ-cell disappears likewise, and shows evident signs of yielding up itself to the protoplasmic rays that proceed from the sperm-pronucleus. The 'protoplasm' deserts the former and radiates round the latter, previously to the disappearance of the two. The doctrine of St. Thomas indicates that this absorption, so called, is actively attributable to the sperm-cell, passively to the germ-cell; the modern physiologists incline to the contrary opinion. Which of the two opinions is in nearer harmony with the acknowledged facts? Again: In this process of 'absorption' it cannot be said that a new cell is already formed, which is the product of the male and female cells; because, before what has been denominated the parent-cell has been formed, there is a monerula stage, during which the ovum is 'a non-nucleated cytod, or simple mass of protoplasm.' This statement is made on the authority of Professor Haeckel who, moreover, assures us that

'the majority of observers[1]' are in agreement with him on this point. Dr. Balfour seems to hold a different opinion, which will be examined presently. For the moment let us limit our inquiry to this real or supposed monerula, bearing in mind that fertilization has already taken place. The question reverts: What is this said absorption that has taken place? Both of the pronuclei have disappeared, involving complete disorganization; and there remains nothing but a mass of 'protoplasm.' Has the protoplasm of the germ-cell absorbed that of the sperm-cell? But what, in plain speech, does this mean? It means that the unorganized matter, previously existing in the two cells, is gathered together in one. But how in one, for there is yet no nucleus? Is it by mere local contiguity? Surely, no one would venture on such a hypothesis, in presence of the patent phenomena of gradual self-adjustment, of perfect ordering by complex segmentation, and of life-movement in the whole *as* a whole,—such as are described in detail by our modern authorities. In a word, there must be an Efficient Cause, intrinsic in the monerula, but with an extrinsically delegated efficacy.

Let us now turn to the statements of Dr. Balfour, touching the process that immediately succeeds the entrance of the spermatozoon into the ovum and the metamorphosis of its 'head' into the male pronucleus. After describing the mutual action of the male and female pronuclei, he adds the following: 'The actual fusion does not take place till after the pronuclei have been in contact for some time. . . . The product of the fusion of the two pronuclei forms the first segmentation nucleus,'—that which Professor Haeckel denominates the kernel or nucleus of the parent-cell (cytula), 'which soon, however, divides into the two nuclei of the two first segmentation spheres[2].' Consequently, he does not seem to admit an intervening monerula stage, but describes the nucleus of the parent-cell, from which the process of differentiation and organization immediately proceeds, as 'the product' of the fusion of the male and female cells. And in the *Summary* at the end of the same Chapter, omitting all mention of a monerula stage, he gives as the twelfth and last stage in the process of impregnation, 'Fusion of male and female pronuclei to form the first segmentation nucleus[3].' But here again we are confronted with the same sort of difficulty.

[1] *Evolution of Man, ch.* viii, *V.* 1, *p.* 178.
[2] *Comparative Embryology, ch.* ii, *V.* 1, *p.* 66.
[3] *Ibidem, p.* 70.

What is this *fusion* of pronuclei? what this *coalition* of the protoplasm of the two cells? Is it purely accidental, or is it indicative of a substantial change? If it is a mere fusion; how are we to account for the fact that the radial striae forsake, as it were, the female pronucleus and form round the male intruder? This looks rather like a victory than a coalition, an absorption than a fusion. Finally: How is it that in the product of this change a capacity is first exhibited for organic and structural development? If it be once allowed that the sperm-cell brings with it a formative virtue conferred on it by the principal agent, the mystery disappears. The sperm-cell, from the time of that substantial transformation which is designated as the fusion, takes the reins into its own hands.

Let us now resume our consideration of the progress of the reproductive action, according to the teaching of the Angelic Doctor, by the light of physiological facts; assuming (as he does) the instance of a human embryo. The matter of the sperm-cell, augmented by the absorption of the germ-cell, immediately evolves under the causal action of the formative virtue a provisional vegetative form, which actuates the protoplasmic matter, and constitutes the parent-cell, or that which Dr. Balfour calls the ovum with its first segmentation nucleus. But at first, says St. Thomas, this form is as if asleep. It cannot function in the way of growth or nourishment. Meanwhile, the formative virtue that accompanied the sperm-cell, commences the work of organization; till organs are evolved, necessary to the exercise of both faculties. In harmony with this doctrine, modern embryology teaches that the parent-cell undergoes a series of symmetrical cleavage or segmentation,—that afterwards the component cells separate off into two groups, (differing in form, colour, affinities, position), forming respectively the intestinal and skin-layers; while an inversion of the entire germ-vesicle takes place, by virtue of which an intestinal cavity is formed as well as a primitive mouth. Is it rash to suppose that at this gastrula stage, the embryo is sufficiently provided with the requisite organs; and that the provisional vegetative form, accordingly, begins to exercise its faculties of assimilation and growth? At all events, very soon after the embryo has reached this stage of development, a notable change ensues. The two primary layers of cells evolve into four. The skin-layer divides into (i.) the skin-sensory layer, and (ii.) the skin-fibrous layer; while the intestinal

or vegetative layers divides into (iii.) the intestinal-fibrous layer and (iv.) the intestinal-glandular layer. By virtue of this new evolution, the embryo now reaches what has been designated as the chordonium stage, which is described as follows by Professor Haeckel: 'The human germ possesses, in all essential points, the organization of a worm[1].' It is not, of course, for the metaphysician to determine the precise epoch at which the first rudimentary animal soul appears in the human germ, for this is the special province of the physiologist; but it is not unnatural to conjecture that the first animal form may be evolved at this stage. Subsequently, the embryo passes through the successive stages of vertebrate organization, from the most imperfect in graduated succession up to the highest and ultimate; when a human soul is created to inform it.

Now, no one would dream of maintaining, that these facts of embryology demonstrate the truth of the teaching of the Angelic Doctor; since no accumulation of phenomena can bear the weight of a demonstration. It suffices to show, as has been attempted here, that they are unexceptionally in harmony with the Scholastic doctrine. About the various theories built upon these facts we are little anxious. The current of time is ever making fresh alluvial deposits. But about ascertained facts it behoves us to be indeed careful; and it may be confidently asserted that no theory touching the essential constitution of bodies—no one, at least, that can stand the test of philosophical analysis—exhibits such unvarying agreement with experimental facts.

It will neither be necessary nor possible to compare the first three observations of St. Thomas (given by way of appendix at the end of the quotations from him, after this third heading on *the process of reproduction*, under the letters, *a*, *b*, *c*,) with the facts of modern physics; since they are all but purely metaphysical. Not so, however, as regards the last (*d*), which is strongly corroborated by the phenomena of both vegetative and animal reproduction. The point, as it may be remembered, is this; viz. that the growth and nutritive action of the embryo proceeds from itself,—that is to say, from its own substantial form,—not from the soul of the mother. To begin with the phenomena of vegetative life: 'The product,' writes Professor Sachs, 'resulting from the sexual process is usually

[1] *Evolution of Man, ch.* xii, *V. I. p.* 403.

a new individual, which has no longer any organic connexion with the mother-plant, and is not united with it in growth. This is the case even in the Muscineae, where the sporogonium, and in Phanerogams, where the embryo is nourished by'—that is to say, receives a supply of nourishing material from—'the mother-plant, but there is no continuity of tissue between it and the latter[1].' Yet more clearly: 'While even in the most highly developed Cryptogams the macrospore still becomes detached from the tissue of the mother-plant, and the full development of the prothallium takes place only after the dissemination of the spores, so that the embryo always arises in structures distinct from those of the mother-plant, the embryo-sac (or macrospore) of all Phanerogams remains, on the contrary, enclosed in the ovule, the endosperm in the embryo-sac, and the embryo in the endosperm. In like manner arises that structure peculiar to Phanerogams, the *Seed*, the testa of which, the product of the envelopes of the ovule, closely invests both endosperm and embryo. The whole becomes separated from the mother-plant after the embryo has attained a certain very variable degree of development. Germination consists in the further development of the embryo at the expense of the endosperm[2].' There are several points worth noticing in this passage. First: In all cryptogams the embryo evolves in structures distinct from the mother-plant. Secondly: As regards phanerogams, the embryo (if it can be so called) is formed in the seed attached to the mother-plant; which at first sight seems to make against the analogy here instituted. But it must be observed, thirdly, that there is no direct connection of tissue between the embryonic structure and the mother-plant. For the embryo is enclosed in the endosperm, both these in the embryo-sac, all three in the testa, or hard external covering formed out of 'the envelopes of the ovule.' It is true that, in the seeds of some phanerogams whose ovules are anatropous, there is supposed to be a direct communication between the seed and the mother-plant, by a so-called feeding-tube (the raphe) which renews the endosperm; but this tube (if it really discharges such an office) does not at all events reach the embryo. Nature, in fact, seems to have isolated the germ, by hedging it in round about with successive envelopes. There are

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[1] *Text-Book of Botany, B.* iii, *ch.* 6, § 30, *pp.* 803, 804.
[2] *Ibid. B.* ii, *Group* 5, *pp.* 422, 423.

only two little entrances by which admission can be gained even within the seed;—to wit, the feeding tube just mentioned, and the micropyle, or little gate, through which the pollen-tube passes in order to fertilize the ovule. Fourthly: The provision of endosperm in the seed, on which the germ feeds, is the strongest confirmation of the fact that the faculty of nutrition is in the embryo itself. Lastly: The true life of the plant commences with its germination; and, when it begins to germinate, it is already entirely separated from the mother. It is true that it continues for a time to feed on the endosperm, provided for it in the seed and stored up in its cotyledons. But all this is food-supply; not intussusception or assimilation.

Turning our attention now to the embryo-growth of the upper grades of animal life, we find a most close correspondence with that of plants as regards the point in hand. In cold-blooded fish, as we have seen elsewhere, fertilization itself takes place after the ova have been discharged from the body of the mother; which seems to run parallel with the sexual reproduction of cryptogams. In birds the ova are separate from the mother after fertilization, and are not yet hatched. In the egg are discovered the shell corresponding with the testa of phanerogamic seeds, the yolk corresponding with the endosperm within the shell, and the germ in the yolk. Using the term, *shell*, generically, it may be said that these three constituents of the fertilized ovum obtain universally in the upper grades of animal life. Oviparous animals, then, seem to answer to phanerogams in the vegetable kingdom; and in their case there can be no reasonable doubt that the embryo nourishes itself. The only case in which there might seem to be some room for hesitation, is that of the mammalia, whose embryos remain in some way connected with the body of the mother for a considerable length of time after animation. In order that the question thus mooted may be fully resolved, it will be necessary to recur to a well-known division of mammalia into non-placental and placental; because there is a considerable difference between the organs of the two. Both non-placental and placental mammalia have this in common,—that they give birth to a structure by which the embryo is shut up in a state of isolation. Either synchronously with the work of fertilization or immediately after, the ovum passes by one of the oviducts into its closed chamber, soon after which it is surrounded by a thick external membrane called the prochorion,—

described by Professor Haeckel to be 'a modification of the original egg-membrane (zona pellucida)[1],' which in the mammalian egg is soon replaced by the chorion[2]. Subsequently,—about the time that the primary structural and organic differentiation is proceeding,—a connected membrane forms round the embryo, to which the name of amnion has been given. It has been thus vividly painted to the imagination by the same Professor. 'In order,' he writes, 'to get a clear and connected view of this important process, we may compare the embryo to a fortress surrounded by a moat and a wall. This moat, or trench, consists of the outer part of the germ-area, etc. . . . To keep up the simile of a fortress imagine that the surrounding wall of the fortress becomes extraordinarily high, and towers far above the fortress. Its edges arch like the crests of a jutting cliff which is about to enclose the fortress; they form a deep cavern, and at last grow together above. At last the fortress lies entirely within the cavern formed by the concrescence of the edges of this mighty wall.' These two outer strata of the germ-area, rising in this way in the form of folds around the embryo and coalescing above it, at last form a spacious sac-like envelope around it. This envelope bears the name of germ-membrane, water-membrane, or amnion[3].' But, if the embryo is thus completely enclosed, whence does it receive its food-supply? In the non-placental animals, 'the circulation,' says the same authority, 'as it exists in the yelk-sac and in the allantois'—two processes arising from the structure of the embryo itself—'suffices for nutrition, as in birds and reptiles[4].' But in the placental animals, in whose case the period of gestation is more protracted, these sources of nutrition are not sufficient. Accordingly, by an admirable provision of nature, the allantois reaches after a time the chorion which adjoins the mucous membrane of the mother, spreads itself flatly over the chorion, and thus forms the placenta. The blood-vessels of the embryo and those of the mother by these means are brought together; and so the embryo is nourished. Here, then, is the difficulty; for it would seem as though, at all events in the instance of the placental mammals, the mother does nourish the embryo. But there is yet one more fact to be mentioned, which puts an end to the difficulty. 'The maternal blood-vessels do not, however,' writes

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[1] *Evolution of Man, ch.* x, *V. I, p.* 289.
[2] *Ibid. ch.* xii, *V. I, p.* 387.
[3] *Ibid. ch.* x, *V. I, pp.* 311–314.
[4] *Ibid. ch.* xix, *V. II, p.* 157.

the same Professor, 'pass directly (anastomosis) into the blood-vessels of the embryonic chorion-tufts, so that the two kinds of blood simply mix, but the partition between the two sets of vessels becomes so thin, that it permits the passage of the most important food-materials, freed from unnecessary matter (transudation or diosmosis)[1].' So then it would appear that, in the instance of the highest orders of animals, as in the lower orders and in the germs of plants, the embryo may indeed receive food-material from the mother, much as the plant receives nourishment from the soil; but the act of nourishing is its own. There is, it is true, a notable difference between the grown plant and embryos of whatever kind. For so long as these latter are not provided with organs sufficiently developed to assimilate the raw material, the food is partly prepared for it by the organs of the mother; yet not in such sort that the embryo does not nourish itself by its own vital powers.

The same doctrine is more obviously true and clear in relation to the sensile faculties. The animal embryo does not see with the mother's eyes, or hear with her ears, or feel with her organs of touch or their corresponding faculties; if it sees, hears, or feels at all, it sees with its own eyes, hears with its own ears, and feels with the nerves of its own body.

4. The fourth and last point on which the Scholastic doctrine will be compared with the teaching of modern embryology, is that which regards the living embryo itself. St. Thomas asserts that the offspring which is born is '*the sperm-cell itself, transmuted and perfected.*' It would seem to be the general opinion among modern physiologists, that the embryo is neither the sperm-cell nor the germ-cell, but the development of a new and independent cell which is the product of these. It is the result, as we are told, of the neutralizing of sexual differentiation. Others, again, there are, who consider the embryo to be the germ-cell developed after fertilization. Both of these opinions seem at first sight to oppose themselves to the teaching of the Angelic Doctor; yet the reconciliation is comparatively easy. Not only are they not really against St. Thomas, but they are not even incompatible with one another; for each of the three regards the embryo from a different point of view. If we simply look to the material cause of the new entity, it is doubtless true to say that it has been developed out

[1] *Evolution of Man, ch.* xix, *V. II, p.* 156.

of the germ-cell. If, on the other hand, we have regard to the evolution of its structure and organism ; then it must be allowed that it proximately originates neither in the sperm-cell alone nor in the germ-cell alone, but in the parent-cell which is formed out of the union of both, and is the starting-point of segmentation. But it is obvious that these modes of regarding the question are purely material ; as legitimate physical investigations must necessarily be. They cannot fathom the depths of the question. How is it that certain protoplasmic cells will develope into plants, others into animals,—that among the plant-productions some are cryptogams, others phanerogams,—that of these latter some are gymnosperms, others angiosperms, and of these again some monocotyledons, others dicotyledons,—that among animals some cells become, (let us say), crustaceans, others insects, others vertebrates,—and that within these divisions cells produce animals, one of one class, another of another ? These are questions which, for their ultimate resolution, depend on the metaphysician. To attribute this constant order in variety to the spontaneous evolution of matter, is a philosophical absurdity, and is moreover at utter variance with established physical facts. There must be two *immediate* causes of these phenomena,—the one extrinsic to the essential nature produced but directive of its determinate development, the other intrinsic to such nature and constituting its specific essence. The one the metaphysician would call the immediate or instrumental Efficient Cause ; the other, the formal cause. Of these the first, according to the Angelic Doctor, is the formative virtue communicated by the substantial form of the father, and residing in the vital spirits with which the sperm-cell has been informed ; the last is the ultimate and perfect form, the antecedent forms being ancillary. Both are after a manner in the sperm-cell ;—the formative virtue actually, the ultimate form virtually, by reason of the derivation of this cell from the principal agent. Hence it is that, as St. Thomas declares, the sperm-cell, having absorbed in itself the germ-cell with its store of matter, *becomes the child ;* after having passed through a series of transformations that have led up to its ordained perfectness of being, in the terse language of the same Doctor, it thus becomes *transmuted and perfected.* It has no part in the material constitution of the embryo, (*e*); but it is the active intrinsic principiant of its development, (*e*); and after a while nearly its whole substance is converted into the vital spirits with

which the embryo is charged, (*f*). Such is the teaching of the Angelic Doctor.

One observation more; and this long Note will be brought to a close. There is a seeming contradiction in the teaching of St. Thomas relatively to this last point of inquiry. In the first quotation he says: 'The active virtue which was in the sperm-cell ceases to exist with the dissolution of the sperm-cell and with the evanescence of the vital spirit that was in it,'—that is to say, as soon as the embryo has reached its complete development. On the other hand, (in No. vi, *f*) he affirms that 'the formative virtue remains, even after the advent of the rational soul; so likewise remain the vital spirits, into which nearly the whole substance of the sperm-cell is converted.' There are two ways of answering this difficulty. The first is to allow that St. Thomas fell into an error in the *De Potentia*, and afterwards corrected himself in the *Summa*. This is the easiest answer, but not the most respectful; nor would any one of equitable mind and of reverential temper have recourse to such an explanation without absolute necessity. The other answer is natural, and seems to be at all points consentient with the teaching of St. Thomas. In the preceding Chapter we have seen that, in the generation of material substance, many of the accidents that formerly belonged to the corrupted substance continue in their essence under the new form of the generated substance, though they receive a renewed existence; provided always that they are compatible with the new form. It may, consequently, be truly said that they vanish, because they lose their former existence; yet that they remain, because they continue under a new existence conferred on them by the new form. In this way, then, the vital spirits and the formative virtue in the original sperm-cell, after the last provisional form has made way for the ultimate and perfect, lose their prior existence in the sperm-cell, but acquire a new actuation in the perfected offspring. The vital spirits, thus as it were renewed by virtue of the once formative, now regulative power, direct the vital functions of the new nature to which they belong. As St. Thomas himself puts it in the same passage: 'That, then, which was previously formative of the body, becomes regulative of the body.'

Corollary.

The above Notes serve to show, that there is no necessity for our betaking ourselves to the direct Agency of the First Efficient Cause,—apart from His Co-operation with the action of second causes, Which is not now in question,—in order to explain the causality of the accidents, when physically separated from the principal agent, in the generation of material substance. Therefore, the Interference of such a Causality can hardly be philosophically admitted; because, as St. Thomas urges, 'since the being of natural and bodily forms consists solely in union with the matter; their production evidently belongs to the same agent, whose it is to transmute the matter: In the second place, because, seeing that forms of this sort do not exceed the virtue, order, and faculty of the principiants that operate in nature, there is no necessity to send back their origin to the operation of principiants of a higher order[1].' Of course, St. Thomas invariably makes an exception of the human soul. The answer of Suarez to these arguments is not satisfactory. He maintains that a Divine Interference is postulated, by reason of the perfection of living substances.

Scholion.

The teaching of St. Thomas seems to have been accepted by Suarez as at least a probable opinion; for this latter Doctor writes, that probably the sperm-cell is an instrument of generation, not by virtue of the accidents only, but likewise because of a substantial form that is in it[2]. In another place be asserts the probability of the opinion, that the sperm-cell after the fertilization of the germ is endued with a vegetative life[3]. Further: The doctrine of the Angelic Doctor is derived from Aristotle, who particularly enforces the position, that the principiant of life is in the sperm-cell, not in the germ-cell[4].

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[1] 'Cum formarum naturalium et corporalium esse non consistat nisi in unione ad materiam; ejusdem agentis esse videtur eas producere cujus est materiam transmutare. Secundo, quia cum hujusmodi formae non excedant virtutem et ordinem et facultatem principiorum agentium in natura, nulla videtur necessitas, eorum originem in principia reducere altiora.' *Po^a. Q.* iii, *a.* 11, *c.*, *init.*

[2] *Met. Disp.* xviii, § 2, *n.* 32.

[3] *Ibid.* § 5, *n.* 5.

[4] ἓν γὰρ οὐκ ἔχει μόνον (*τ. ε.* θῆλυ) τὴν τῆς ψυχῆς ἀρχήν. . . . . ταύτην γὰρ τὸ τοῦ ἄρρενος ἐπιφέρει σπέρμα. *De Gen. Animal. L.* ii, *c.* 3, *v. f.*

§ 2.

THE FORMAL PRINCIPIANT BY WHICH SUBSTANCE GENERATES ACCIDENTS.

After having carefully considered in the previous Section the question, beset with difficulties, touching the formal principiant in substantial generation; it follows that we examine into a problem, no less difficult, concerning the formal principiant in the generation, or production, of accidents. The main difficulty, that confronts us at the outset, may be thus stated. The formal principiant in the production of accidents must be either a substance or an accident; for these divide all real being between them. It would seem at first sight as though it must be an accident; for the effect and the formal principiant must be in the same category. If, then, the effect is an accident; the agent should be an accident. But if this be so; we are necessarily involved in an infinite process. To put it symbolically: If *a* (an accidental effect) postulates *b* (an accident) as its cause; *b*, as being itself an accident, will postulate *c*; *c* will require *d*; and so on for ever. There can, therefore, be no commencement in this regress; consequently, no causality. In the hypothesis, on the other hand, that substance is the formal principiant; there are difficulties equally grave to be encountered. For it would follow that all accidents would be bereft of causal efficiency, which is contrary to experience as well as to the common judgment of mankind; and that they would figure as meaningless additions to substance, not subserving it even as ornaments. It would further follow from the same hypothesis, that all the so-called faculties and forces of material substance would be nothing save the substantial form in action,—a position which is philosophically untenable, since it supposes that the essential can become accidental, or that the accidental can become essential. At first sight there might seem to be a way out of the difficulty, by denying the validity of the dilemma. It might be urged that of some accidents substance is the Efficient Cause immediately; of some, through the medium of other accidents. But it must be seen at once, that the arguments just set forth seem to impugn the possibility of such a solution; unless a sufficient reason can be given for the implied difference between the two classes of accidents. *How* is it possible for substance to be the principiant of any accident whatsoever?

Such is the problem. Nor can it be denied that the solution just proposed is fundamentally correct, though not sufficiently explicit. In order to facilitate matters, let us start by realizing what is admissible and what not admissible in each hypothesis. There is nothing, then,—be it understood,—to hinder one accident from becoming Efficient Cause of another, provided that an infinite regress can be avoided; that is to say, provided that philosophy can find a primordial cause in this chain of secondary causation,—a principiant from which the causality can start. Similarly: There is nothing to prevent substance from being principiant of an accident, provided that it can do so without impairing or destroying the unity and immutability of its essential nature. These are the two points to be ever kept in view, while in search for a satisfactory solution of the problem.

By way of prelude it is necessary to refer again to the well-known division of accidents, which is to be found in every logical compendium. Accidents are either properties or accidents specifically so called. A property is an accident, indeed, because it forms no part of the essential nature of that substance to which it belongs. It is accessory to such nature. Nevertheless, it is an unalienable heritage of the substance, as flowing from its essence. Thus the capacity of laughing is a property of man; because his intellect is capable of appreciating the ludicrous,—the *αἰσχρόν τι καὶ διεστραμμένον ἄνευ ὀδύνης*,—and his body has a midriff, (forming part of its essential organism), which is capable of producing the particular sound. On the other hand, accident specifically so called, while evidently claiming no share in the essence of the substance that it informs, is not even a property. As its Greek name, *συμβεβηκός*, so definitely indicates; it is a fortuitous addition to its Subject, having no intrinsic right, (as it were), to be there. A property, then,—as is plain,—stands in a more intimate relation to the substance that it informs, than an accident specifically so called. Is it not possible, therefore, that properties may supply us with the missing clue? Let us see.

PROPOSITION CCL.

An accident which is a property of its substance is produced by natural resultance.

Prolegomenon.

It may be asked what is meant by *natural resultance*. As a rule, an explanation has been hitherto given of any new term in the Enunciation of a Thesis. Here, however, it will be necessary to make an exception; because it is precisely this point, touching the thing signified by the phrase, that has formed the subject of contention among the Doctors of the School. Accordingly, one main object of the two Propositions that follow, as well as of the present Proposition, will be to determine its true meaning.

Declaration of the Proposition.

About the truth enounced in this Thesis there is no controversy in the School. All are agreed that there is an essential difference between the Efficient Causality by which a property is produced, and that by which an accident (for henceforth in this discussion *accident* will be used according to its specific meaning) is produced. Let us go at once to St. Thomas. 'The emanation of properties,' he observes, 'from their Subject is not by means of any transmutation, but by a natural resultance; just as one thing naturally results from another, as, for instance, colour from light[1].' So again, having come to the conclusion that one faculty of the soul owes its origin to another, he proposes to himself this difficulty: 'It seems as though one faculty of the soul cannot derive its origin from another. For of those things which are simultaneous in their existence, one cannot owe its origin to another. But all the faculties of the soul are concreated together with the soul. Therefore, one faculty does not take its origin from another.' To this objection he thus makes answer: 'As a faculty of the soul flows from the essence, not by transmutation but by a kind of natural resultance, and exists simultaneously with the soul; so is it precisely with one faculty in regard of another[2].' Particular

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[1] 'Emanatio propriorum accidentium a subjecto non est per aliquam transmutationem, sed per aliquam naturalem resultantiam; sicut ex uno naturaliter aliud resultat, ut ex luce color.' 1ae lxxvii, 6, 3m.

[2] 'Videtur quod una potentia animae non oriatur ab alia. Eorum enim quae

attention is invited to these two passages; since we shall have to recur to them subsequently, as decisive of more than one point in the problem that is now before us. Suarez so far follows the Angelic Doctor. 'Properties,' he writes,—'especially such as are attendant on an entity, or are its due, by virtue of its form,—are caused by substance not only materially and finally, but also efficiently by natural resultancy; either immediately if it be a primary, or mediately if it be a secondary property. This is the teaching of St. Thomas in the first part of the *Summa*, the seventy-seventh Question, Article the sixth, where he is speaking of the faculties of the soul. But the same reason applies to any form whatsoever; and to the properties that are attendant upon it, or are due on account of it[1].'

Now, from the two passages of the Angelic Doctor quoted above, as well as from others that will be seen in the sequel, it would appear that there are three principal characteristics of the resultance of a property from its substantial Subject. (i.) It is a natural effluence, or emanation, from the essence of the Subject. Consequently, as St. Thomas expressly states, in a passage quoted elsewhere[2], the property belongs to the integrity of its Subject considered as a potential whole. What would a human soul be, if denuded of its faculties of intellect and will? or what would the soul of a brute animal be without its faculties of sense? The first act of existence would be rendered useless and null; if the substantial entity were deprived of its second act of operation, by which alone it can attain to its end. But without its proper faculties this second act would be impossible. Wherefore, by the ordinance of nature these facultative properties flow necessarily from the essence of their Subject. (ii.) The resultancy of these properties is naturally due to the substance which they inform. But nature always pays her debts. As the proverbial saying has it: *Nature is never wanting in things necessary.* Accordingly, it may be concluded that the surest provision would be made, by which its properties should be secured to each essence. (iii.) This re-

simul esse incipiunt, eorum unum non oritur ab alio. Sed omnes potentiae animae sunt animae concreatae. Ergo una earum non ab alia oritur.

'Ad primum ergo dicendum, quod sicut potentia animae ab essentia fluit, non per transmutationem sed per naturalem quamdam resultationem, et est simul cum anima; ita est etiam de una potentia respectu alterius.' 1^{ae} lxxvii, 7, 1^{m}.

[1] *Met. Disp.* xviii, § 3, *n.* 4.

[2] *Book* v, *ch.* 2, *V. II, p.* 326.

sultance is at least a physical, and (as we shall see presently) according to the teaching of St. Thomas, it is likewise a metaphysical necessity. Each entity *must* be proximately capable of its own natural operation; it *must* in consequence have its own proper faculties. These three points will receive further development, as we go on. Thus much suffices for the present.

Having so far secured our position, the main question confronts us touching the nature and agent of that special kind of causality, to which the name of resultance has been appropriated. It is a distinct action,—distinct, that is, from the action productive of the substance from which these properties flow. Is the Efficient Cause of the substance Efficient Cause likewise of the properties? Or is the substantial form of the Subject Efficient Cause of its properties? Such is the problem to be solved. Wherefore,

PROPOSITION CCLI.

According to the doctrine of St. Thomas, the resultance of a property is effected without any change in the substantial Subject.

The Proposition is thus declared.

St. Thomas asserts, in both the passages cited in the preceding Thesis, that properties do not emanate from their Subject by way of *transmutation*. Touching this assertion, there are two observations to be made. First: From the nature of the case it is plain that the term, *transmutation*, can apply only to the Subject of such resultance,—that is to say, to the substance whose the resultant property is. Secondly: It is to be observed that, in the generation of accidents, there is no other physical motion than that of transmutation. When the white skin becomes red, there is a transmutation from white to red. When the mind thinks a thought, there is a transmutation from faculty to act. When a man first sits and then stands, there is a transmutation from one position to another. Hence it follows that, according to St. Thomas, there is no physical motion in the resultance of properties.

Note.

The phrase, *physical motion*, has been advisedly adopted. Metaphysical motion there must be, in all cases where there is a passage from not-being to being. Thus, for instance, there is no physical,

but there is metaphysical motion in an act of creation. There is no physical motion; because physical motion essentially connotes a Subject.

PROPOSITION CCLII.

A property is congenital with its Subject. Wherefore, it postulates no other physical formal principiant for its resultance than the agent that causes the Subject to which it belongs.

I. The first member of the Proposition, in which it is affirmed that *a property is congenital with its Subject*, is thus declared. Such is the explicit statement of the Angelic Doctor. It seems to be plainly enough implied in the former of the two passages adduced in the *two hundred and fiftieth* Proposition; for in it the resultance of a property from its Subject is compared with the resultance of colour from light. But colour is congenital with light. In the second passage, however, he explicitly asserts as much. For,—speaking of the faculties, which are properties, of the soul,—he declares in the objection, that *these faculties all together are concreated with the soul;* while in his answer he accepts and confirms the statement by asserting that the faculty *exists simultaneously with the soul*, and connects this observation with the fact that the faculty flows from the essence by resultance and not by transmutation.

The authority of St. Thomas is supported by reason. That which is strictly necessary to an entity, in order to its being capable of its second act of natural operation, must be congenital, in the ordering of nature, with such entity. But its properties are necessary to an entity, in order to its being capable of its second act. Therefore, etc. The *Major* is thus declared. The proximate end of a creature is its natural operation. Hence, the Philosopher defines the end of man to be a certain energizing of the soul[1]. Now, since the reason for the existence of a thing is the consecution of its end; the absence of the only possible means, at the time of its production, for the attainment of this end, would argue either a want of wisdom or a want of power in the Efficient Cause of nature. For He would prescribe an operation to His creature, and at the same time deprive it *pro tanto* of the possibility of such operation. Its

[1] Ψυχῆς ἐνέργειά τις κατ' ἀρετὴν τελείαν. *Ethic. Nic. L.* i, *c.* 13.

existence for such time would be purposeless. But such a hypothesis is intolerable in its very expression. The *Minor* is universally accepted. For the faculties of a substance are among its properties; and no substantial form—since its causality is after a manner exhausted in the first act—can operate save through the medium of its faculties. Again: That which is essential to the potential totality of a nature, must be congenital with that nature. But, according to St. Thomas, the faculties belong to the integrity of the human soul; and the same principle may be extended to every specific property of a substantial form[1]. Therefore, etc.

II. The second member,—wherein it is asserted that, in consequence, *a property postulates no other physical formal principiant for its resultance, than the agent that causes the substance to which it belongs*,—is thus proved.

i. The assertion is supported by the authority of St. Thomas. (*a*) It is, first of all, plainly deducible from his methods of expression, wherever he treats of this question, that he means to exclude all physical causal action of the substantial form from the said resultance. In one place, he speaks of the faculties of the human soul as *coming forth, flowing, from the essence*[2], *arising out of the essence*[3]. Elsewhere, he says that they *proceed*[4], and again that they are *rooted in the soul*[5]; and again that they *flow from the essence*[6]; in another place that they *accompany the human soul*[7]; in another that they *proceed from the one essence of the soul*[8]; and lastly,—not to add further to the list,—that they *flow from the essence*[9]. It is true that there are one or two passages which at first sight seem to tell the other way; but their consideration is reserved for the difficulties to be discussed at the end of the next Proposition. Now, this habitual and apparently studied use of expressions that are not connotative of causal action,—especially on the part of one who is ordinarily so precise and careful in his choice of words,—is, if anything, a clearer indication of his mind than are

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[1] See the *third Chapter of this Book, V. II, pp.* 325, 326.
[2] 'Egrediantur, fluant, ab essentia;' 1 *d.* iii, *Q.* 4, *a.* 2, *c.*
[3] *Ibid.*
[4] 'Procedere,' *Ibid.* 2m.
[5] 'Radicantur in anima,' *Opus. I.* c° 89.
[6] 'Ab essentia fluunt,' *Verit. Q.* xiv, *a.* 5, *c.*
[7] 'Consequantur animam humanam,' *Opus. I,* c° 87.
[8] 'Procedunt,' 1ae lxxvii, 6, 1m; *et ibid. a.* 7, *c.*
[9] 'Fluit ab essentia,' *Ibid.* 3m.

those other passages which more or less explicitly bear upon the question. (*b*) A similar deduction is drawn from his repeatedly attributing the production of these properties to a natural resultancy, as contradistinguished from a transmutation. For, in every case wherein an accidental form is educed out of the physical potentiality of its Subject by the physical action of some principiant, there must be a real *transmutation;* just as, whenever a substantial form is educed out of the physical potentiality of its Subject, there must be real *transformation.* To deny, therefore, that the production of a property is by means of a transmutation, is equivalent to affirming that it is not the result of *distinct* causal action,—in other words, that it is jointly caused or, better perhaps, that it is the natural result of previous causation. (*c*) Again: It is quite clear that, when St. Thomas declares the *emanation* of properties from their subject by *resultance,* he understands something altogether distinct from the causality by which accidents are ordinarily produced. The precise meaning will be seen presently. (*d*) Fourthly: There is another mode of expression adopted by St. Thomas, which yet further confirms the conclusion. Against the proposition, that the faculties of the soul *flow* from its essence, he proposes to himself the following objection: 'That from which a thing proceeds, is cause of the thing. But the essence of the soul cannot be said to be cause of the faculties; as is plain, if one runs through each of the genera of causes.' St. Thomas replies: 'A Subject is final, as well as *in a certain sense* active, cause of its property; and material cause likewise, inasmuch as it is susceptive of the accident[1].' He declares in this passage without any modification, that the Subject is the final cause of its property, as likewise without modification that it is material cause of the same, because it is susceptive of the accident, receptive of it as of an informing form; but when he speaks of it as the Efficient Cause, he introduces a modifying phrase,—viz. that it is such only in a certain sense. (*e*) Once again: St. Thomas in another place moots the old question: Whether the faculties of the soul are included under its essence. In his resolution he thus

[1] '(2) Praeterea illud a quo aliquid procedit, est causa ejus. Sed essentia animae non potest dici causa potentiarum, ut patet discurrenti per singula causarum genera. Ergo potentiae animae non fluunt ab ejus essentia.

'Ad secundum dicendum, quod subjectum est causa proprii accidentis, et finalis, et quodammodo activa, et etiam materialis, inquantum est susceptivum accidentis.' 1ae lxxvii, 6, 2m.

expresses his mind: 'Wherefore I affirm that the faculties of the soul are accidents; not that they are common accidents which do not flow from the principiants' (to wit, *this* form and *this* matter) 'of the individual; but as properties they accompany the species, deriving their origin from its principiants. All the same, however, they belong to the integrity of the soul; so far as it is a potential whole, having a certain facultative perfection which is made up of a diversity of powers[1].' Let us pause awhile to consider carefully some of the expressions in this passage; for a due understanding of these will land us safely at a just conclusion. The Angelic Doctor draws a distinction between properties and accidents. The former, he tells us, trace their origin to, and accompany the principiants (or essential constituents) of, the specific nature. They belong, therefore, to the specific nature as such. The latter, on the contrary, neither trace their origin to nor accompany the essence, but to the particular constituents of this or that individual in the species. Further: Though not included in the essence itself of the soul,—which is absolved in the first act of being,—they belong to the integrity of the soul as constituted in its second act of natural operation. They are part of the essence considered as a potential whole, and are metaphysically necessary to its natural operation. Thus a property occupies a middle place between species and accident. Species denotes the essence. Accident neither denotes nor connotes the species *as such*, but connotes the individual. Property does not denote the essence, but connotes it; and does not connote the individual.

Corresponding with these three predicables, there are three wholes,—to wit, the universal, the integral, and the potential. Let St. Thomas be our guide in this part of our analysis. 'A potential whole,' he says, 'is midway between a universal whole and an integral whole. For a universal whole is present to each and every part in its entire essence and virtue,—as, for instance, *animal* to *man* and *horse*; and it is therefore predicated of each part. An integral whole, on the contrary, is not in each and every part, either

[1] 'Et ideo dico, quod sunt accidentia: non quod sint communia accidentia, quae non fluunt ex principiis speciei, sed consequuntur principia individui, sed sicut propria accidentia, quae consequuntur speciem, originata ex principiis ipsius: simul tamen sunt de integritate ipsius animae inquantum est totum potentiale, habens quamdam perfectionem potentiae, quae conficitur ex diversis viribus.' 1 *d.* iii. *Q.* 4, *a.* 2, *c.*

according to its entire essence or according to its entire virtue. Wherefore, in no sort is it predicated of each separate part, but after a fashion (though improperly) of all the parts together; as if we should say that the *walls*, *roof*, and *foundation* are a *house*. Now, a potential whole is present to each part in its essential nature, but not in the perfectness of its virtue. Wherefore it can be predicated of each and every part, but not so properly as a universal whole [1].' To explain and illustrate the above doctrine: A universal whole, either generic or specific, can in all propriety be predicated of each and every part contained under it; because it is present to each and every part according to its entire essence and virtue. *Man*, for instance, is equally predicable of a *Turk*, of a *Hottentot*, of an *Englishman*; because the essential nature and properties of human nature are adequately in each of the three. Each has a soul and a duly organized body together with the faculties of intellect and will, etc. An integral whole, on the contrary, cannot under any shape whatsoever be predicated of each of its parts. Thus, for instance, it cannot be reasonably affirmed that the *tail* is a *cat*, or the *paws* are a *cat*, or the *ears* etc. are a *cat*; because this would be equivalent to the affirmation that a part is equal to the whole. In a sort of way an integral whole may be predicated of all the parts collectively;—for instance, the *tail*, *paws*, *ears*, etc., are a *cat*. But such predication is not proper; because the whole cannot be predicated of the assemblage of parts *as parts*, but as constituents of the whole, and such predication is tautological. Finally: A potential, or facultative whole is between these two. It can be predicated of each part, though not so absolutely or perfectly as a universal whole. The reason is, that it is equally present to each part in the entirety of its facultative perfection. Thus, for instance, the *soul* is equally present in each of its faculties; but the soul as *intellectual* is not

[1] 'Quod (sc. totum potestativum) medium est inter totum universale et totum integrale. Totum enim universale adest cuilibet parti secundum totam suam essentiam et virtutem, ut animal homini et equo; et ideo de singulis partibus praedicatur. Totum vero integrale non est in qualibet parte neque secundum totam essentiam, neque secundum totam virtutem; et ideo nullo modo de singulis partibus praedicatur, sed aliquo modo, licet improprie, de omnibus simul; ut si dicamus quod paries, tectum, et fundamentum sunt domus. Totum vero potentiale adest singulis partibus secundum totam suam essentiam, sed non secundum totam virtutem; et ideo quodammodo potest praedicari de qualibet parte, sed non ita proprie, sicut totum universale.' 1^{ae} lxxvii, 1, 1^{m}.

present to or predicable of the *will*, or volitional faculty, as such; *à fortiori* the soul—even as a facultative whole—is not predicable of the *faculties of sense* according to its whole virtue of *intellect* and *will*. It is not true, in other words, that the soul as intellectual is the soul as sensile. Why is this? Because the faculties of the soul are the instruments of the latter, receiving their distinction (one might almost say) from the distinction of their respective formal objects. Accordingly, they are the soul in its natural operation; and for this reason belong to its very nature as constituted in its second act. They are, metaphysically speaking, accidents; for the simple reason that they are faculties, and are not formally included in the first act. Essence is immutable and perfect; whereas they are mutable and perfectible by and in their acts. Is, then, the soul a composite of essence and of faculties? Yes; and no. It does not, cannot, equal the simplicity of the Divine Nature. Hence, there is a sort of composition between essence and faculty, between first and second act; but it is metaphysical. On the other hand, the soul is a simple though incomplete substance; therefore the composition cannot be physical. The present question has been already discussed incidentally in the first Difficulty under *the hundred and sixty-second* Proposition[1]; but its paramount importance in relation to the present problem must plead our excuse for adding somewhat to that which has been there stated. It is to be noticed, then, as confirmatory of the opinion that the composition is not physical but metaphysical, that the Angelic Doctor, whenever he has occasion to touch upon the subject, makes use of some modifying phrase. To satisfy ourselves with one example out of many: In opposition to his own conclusion that *the essence of the soul is not its own facultativeness*, (the coinage of the word will be excused, if it contributes to distinction of idea), he proposes the following objection: 'A simple form cannot be a Subject,'—that is to say, of an accident in its generic signification. 'But the' human 'soul is a simple form; since it is not composed of matter and form, as has been already admitted. Therefore, the facultativeness of the soul is not in this latter as in a Subject.' St. Thomas replies: 'Though the soul is not composed of matter and form; nevertheless it has a *sort of admixture* of potentiality, and *on this account may be said* to be

[1] *V. II, pp.* 324-334.

the Subject of an accident[1].' This answer becomes clearer and more confirmative of the present contention, if compared with the *body* of the article. 'The human soul,' he writes, '*in so far as it is a form*, is not an act ordered to an ulterior act, but is the formal term of generation. Hence, that it is in potentiality yet further to another act, *does not properly appertain to it in virtue of its essence as a form*, but in virtue of its facultativeness. Accordingly, the soul itself, considered as Subject of its facultativeness, *is designated* as the first act ordained to the second act. . . . It remains, therefore, clear that the essence of the soul is not its facultativeness; because there is nothing that is in potentiality to act *in its character of act*[2].' This argument may be thus paraphrased. The soul in its essential nature is a form. It is, therefore, fully constituted in its essence by the first act of informing the body, and of thereby constituting the human substance. Such is the formal term of generation. Therefore, if we consider the same soul as ordered to its second act,—that is to say, as possessed of the requisite faculties for its natural operation,—we go beyond the formal essence, (unless, indeed, the first and second act are indifferently one, which is true of God alone, not of any creature). The reason which St. Thomas alleges for the distinction between the essence and the faculties of the soul, is this: The soul as being essentially a form, is essentially an act; but an act, formally and exclusively considered as such, cannot include in itself any potentiality to another act. But such an explanation is quite incompatible with the concept of a physical distinction between the two. (*f*). Once more: St. Thomas categorically states, in a passage already quoted in a previous chapter[3], that, 'though we can cognize the

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[1] '(6) Praeterea, forma simplex subjectum esse non potest. Anima autem est forma simplex, cum non sit composita ex materia et forma, ut supra dictum est. Non ergo potentia animae potest esse in ipsa sicut in subjecto.

'Ad sextum dicendum, quod anima, licet non sit composita ex materia et forma, habet tamen aliquid de potentialitate admixtum, ut supra dictum est quaest. 75, art. 5. Et ideo potest dici subjectum accidentis.' I^ae lxxvii, 1, 6^m.

[2] 'Non enim, inquantum est forma, est actus ordinatus ad ulteriorem actum, sed est ultimus terminus generationis. Unde quod sit in potentia adhuc ad alium actum, hoc non competit ei secundum suam essentiam, inquantum est forma, sed secundum suam potentiam; et sic ipsa anima, secundum quod subest suae potentiae, dicitur actus primus, ordinatus ad actum secundum. . . . Relinquitur ergo quod essentia animae non est ejus potentia; nihil enim est in potentia secundum actum, inquantum est actus.' *Ibidem, c.*

[3] See *ch. ii, V. II, p. 326, note 2.*

quiddity of the soul apart from its faculties, yet the existence of the soul without its faculties is *impossible* and *inconceivable.*' Therefore, according to the Angelic Doctor, the real existence of the soul without its faculties is not only a physical, but a metaphysical impossibility; for that which cannot endure as a term of thought, must violate the principle of contradiction. Cajetan[1] denies with apparent justice, that, in every instance of a real distinction, the distinct entities must necessarily be capable of physical separation; and appeals to the case of the essential constituents of material substance. Consequently, he admits a real distinction that is not physically real. This opinion has a very great weight of probability in its favour. Anyhow, one thing at least is certain,—that, in the opinion of St. Thomas, the creation of the soul without its faculties is impossible *de potentia absoluta.* (*g*). St. Thomas, in the second passage under the *two hundred and fiftieth* Proposition, admits plainly enough that the faculties are *concreated* with the essence of the soul; like as are the matter and the substantial form in the elementary bodies. (*h*). Finally: St. Thomas asserts[2], that the emanation of the faculties from the essence of the soul is precisely similar to the emanation of one faculty from another, more particularly in three ways;—viz. that it is by a sort of resultancy, that it is not by transmutation, and that in both cases the principiant and principiate exist simultaneously. But it is quite plain, and is generally admitted, that no faculty of the soul exercises any causal action in the production of another, and that they are all jointly produced by one and the same Efficient Cause.

To sum up the evidence: St. Thomas repeatedly and, so far as one can judge, intentionally uses, in order to express the nature of the dependence of the faculties of the soul on the essential nature of the soul, a variety of terms which in their collective force seem to exclude anything like a *causal* relation. Again: He asserts a resultancy in connection with the production of the psychical faculties, which is not a transmutation; which seems to exclude any distinct Efficient Causality whatsoever. Yet again: St. Thomas declares that the soul is Efficient Cause of its faculties only in a certain sense, not absolutely as in the case of the other causes

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[1] *Comment. in* I^ae liv. 3, *Par.* '*Ad tertiam.*'

[2] I^ae lxxvii, 7, I^m.

mentioned. Further: When St. Thomas tells us that the faculties, though forming no part of the essence of the soul or of its first act as constitutive form, are nevertheless necessary to its integrity, and ascribes to the two respectively the nature of first and second act as foundation of their distinction; he further confirms the position of an absence of causal action in the relation of the one to the other. Yet again: If the union between the soul and its faculties is so intimate, that the existence of the former without the latter is impossible and inconceivable; it seems to follow that the soul cannot be in any true sense Efficient Cause of its own faculties, since such a connection would establish at the most a physical necessity. But the opposite of that which is only physically necessary, can never be inconceivable. Yet again: If the faculties were concreated with the soul, as St. Thomas seems to admit; the soul cannot be Efficient Cause of its faculties. Lastly: If the faculties of the soul result from the soul itself, precisely as one faculty results from another; the soul cannot be Efficient Cause of its faculties, since there is no causal efficiency between the faculties in their mutual dependence. On the contrary, as the Angelic Doctor plainly teaches, the resultancy of the one from the other depends upon the order of priority by which the two are measured. If by order of generation, the more perfect are resultants of the less perfect; if by order of nature, on the contrary, the less perfect are resultants of the more perfect. We shall see that such is his doctrine in the next Proposition.

It may be affirmed, therefore, with warrant that, in the judgment of the Angelic Doctor, the soul is not strictly and physically speaking Efficient Cause of its own faculties. We must, accordingly, look elsewhere; and we have the authority of the same Doctor for saying that they are concreated with the soul. Hence, the same causal efficiency which gives existence to the soul, gives existence likewise concomitantly to the faculties of the soul.

Note.

In the above proof of the second Member it may be objected, that the evidence brought forward refers exclusively to the faculties of the human soul. This is owing to the fact that St. Thomas is chiefly occupied with these, as affording the most interesting at once and the most difficult instance; and because they came more particularly in his way. But as Suarez assures us in a passage

already quoted, 'the same reason applies to any form whatsoever and the properties that are attendant upon it or are due on its account.'

ii. The same Member is proved by intrinsic evidence of reason. That which an entity postulates as necessary to its second act or natural operation, is produced by the same causal action that produces the entity itself. But an entity essentially postulates its faculties as necessary to its natural operation. Therefore, etc. The *Major* is thus declared. If that which an entity essentially postulates as necessary to its natural operation is not produced by the same causal action that produces the entity itself; then it is either produced by some cause extrinsic to the substance itself and distinct from the Efficient Cause of this latter, or by the substantial form of the substance. But neither of these hypotheses is admissible. Therefore, etc. The *Major* is evident. Each Member of the *Minor* is proved in this way. First: The faculty cannot be produced by any other extrinsic cause, which must evidently be finite; for the result of this would be, that the entity in question would owe to other than the Efficient Cause of its own production a capacity for its own natural operation. But this is a monstrous supposition; for it amounts to this, that an entity might be produced in being without the power of operating towards the end for which it was produced or,—if a living body,—of exercising its own vital functions, remaining wholly inactive, by the defect, unreadiness, or ill-will (as the case might be) of another entity. Neither can it be reasonably urged, that the property might be produced by another distinct action (strictly speaking) of the Efficient Cause of the essential nature. For there are no known data for such action, and there is no sufficient reason for its necessity. Secondly: The faculty or property cannot be produced by the real Efficient Causality of the essential form of the entity itself; because this would involve an infinite process. For the substantial form, being fully constituted as form in its first act of being, cannot operate and, consequently, exercise any causal action, save through the medium of some property. In order, therefore, to be able to produce a property, it would postulate another antecedent faculty; and so on for ever.

PROPOSITION CCLIII.

The property is essentially dependent in its production, entity, and existence, on the Subject of which it is the potential complement.

Prolegomenon.

So far as we have gone, it would almost seem as though a property ought rather to be included in the essence itself to which it is said to belong, than be termed a resultance of the essence. There must be some true sense in which it can be maintained that a property is the result of the substantial form, although not an effect of its causality; otherwise what relevancy can there be in the term, *resultance*? The present Thesis proposes a solution of this question.

Declaration of the Proposition.

It is evident that a property is essentially dependent on its Subject in two of the three ways enumerated; unless it were so, it could not be included under the category of accidents. For all accidents agree in this, that they exhibit in their essential nature a necessary dependence on their Subject. In the order of nature, therefore, their entity, existence, continuance, depend on their actual inherence in their Subject; and, even in the hypothesis of a supernatural interference by which their actual inherence should be suspended, they would still retain their essential tendency to inhere, and would be for such time in a state (as it were) of violence.

But the one difficulty is: How can properties be essentially dependent on their Subject in the matter of their production, in the hypothesis that the Subject is not their Efficient Cause? Unlike other intrinsic and intrinsically generated accidents, they are not strictly speaking produced (as has just been shown) by the causal action of the substantial form, but are concreated or jointly produced with the essential nature by one and the same action of one and the same Efficient Cause. Where, then, is there room for this dependence in production? We shall be able to pave the way for an answer to this difficulty, by considering, under the guidance of the Angelic Doctor, the dependence of one faculty of the soul upon another; for this Doctor assures us that the two causes, so far as regards the present question, are altogether parallel. 'There is observable,' writes St. Thomas, 'a threefold order amongst them. Two of these

are based upon the dependence of one faculty on another; while the third is derived from an order in their objects. Now, dependence of one faculty on another can be taken in two ways: First, according to order of nature; in that things perfect are, naturally, prior to things imperfect: Secondly, according to order of generation and of time; inasmuch as the way to the perfect is through the imperfect. If we understand the order of the faculties of the soul in the first way; the intellectual faculties are prior to the sensile faculties. Accordingly, they direct and rule over these latter. In like manner, the sensile faculties within the same order are prior to the faculties of the nutritive soul. But assuming *order* in the second sense, it is just the reverse; for the faculties of the nutritive soul are prior in the way of generation to those of the sensile soul. Hence, they make ready the body for the operation of these latter. It is the same with the sensile soul in regard of the intellectual faculties[1].' St. Thomas elsewhere gives another explanation of this order of generation, which, though metaphysical rather than physical, leads us precisely to the same conclusion. 'Seeing that the essence of the soul,' he writes, 'stands to its faculties in the relation of an efficient and final principiant, as well as of a material principiant, either separately by itself or in conjunction with the body; (now the agent and end are more perfect, while the material principiant is less perfect); it follows that the faculties of the soul which are prior in order of perfection and of nature, are principiants of the others after the manner of a final and of an Efficient Cause. For we plainly perceive that the senses are for the sake of the intellect, and not *vice versa*. And the senses are a sort of defective participation of the intellect; hence, in origin of nature they are after a sort from the intellect, as the imperfect from the perfect. Considered, however, as material principiant'—or Subject

[1] 'Triplex autem ordo inter eas attenditur; quorum duo considerantur secundum dependentiam unius potentiae ab altera; tertius autem accipitur secundum ordinem objectorum. Dependentia autem unius potentiae ab altera dupliciter accipi potest: uno modo secundum naturae ordinem, prout perfecta sunt naturaliter imperfectis priora; alio modo secundum ordinem generationis et temporis, prout ex imperfecto ad perfectum venitur. Secundum igitur primum potentiarum ordinem potentiae intellectivae sunt priores potentiis sensitivis, unde dirigunt eas, et imperant eis; et similiter potentiae sensitivae hoc ordine sunt priores potentiis animae nutritivae. Secundum vero ordinem secundum e converso se habet; nam potentiae animae nutritivae sunt priores in via generationis potentiis animae sensitivae, unde ad earum actiones praeparant corpus; et similiter est de potentiis sensitivis respectu intellectivarum.' 1ae lxxvii, 3, *c.*

—'contrariwise, the imperfect are principiants in regard of the others; as the soul possessed of the sensile faculties is considered as Subject, and something material, in regard of the intellect. And on this account the less perfect faculties are prior in way of generation, for *animal* is generated before *man*[1]'—that is to say, in human generation. The last order, denominatively assumed from a certain order in the respective objects of the faculties, has been omitted in the quotation, as irrelevant to the present controversy.

Before going further, the reader's attention is directed to two things in these two passages;—(*a*) The habitual use of modifying terms, as *sicut*, *quodammodo*, *quoddam*, *accipi*, *considerantur*, *per modum*, etc.: (*b*) The identification, even in the illustrations, of the dependence of the faculties on the essence with the dependence of the faculties on one another.

The explanation given in the above quotations seems to point unmistakably to one conclusion, viz. that the entitative dependence of the faculties on each other is metaphysical, not physical; for, according to the way of viewing such dependence, two orders present themselves in inverse ratio. In the one, the dependence is represented as attaching to the less perfect faculties; in the other, as attaching to the more perfect. But both cannot be physically realized in one and the same faculty; so that the intellect should physically depend, and at the same time should physically not depend, on the sensile or nutritive faculties. On the other hand, it is quite plain that this dependence is not a mere logical concept. Accordingly, it is metaphysical. If so, it is not the result of any physical efficiency.

Which, then, of the two orders indicated, should we take for arriving at a safe conclusion touching the present question? Evidently, not that of generation. But why? Because it *is* the

[1] 'Quia essentia animae comparatur ad potentias sicut principium activum et finalis, et sicut principium susceptivum vel seorsum per se, vel simul cum corpore; agens autem et finis est perfectius; susceptivum autem principium inquantum hujusmodi, est minus perfectum; consequens est quod potentiae animae quae sunt priores secundum ordinem perfectionis et naturae, sint principia aliarum per modum finis et activi principii. Videmus enim quod sensus est propter intellectum, et non e converso. Sensus etiam est quaedam deficiens participatio intellectus; unde secundum naturalem originem est quodammodo ab intellectu, sicut imperfectum a perfecto. Sed secundum viam susceptivi principii e converso potentiae imperfectiores inveniuntur principia respectu aliarum; sicut anima, secundum quod habet potentiam sensitivam, consideratur sicut subjectum et materiale quoddam respectu intellectus. Et propter hoc imperfectiores potentiae sunt priores in via generationis; prius enim animal generatur quam homo.' *Ibid. a.* 7, *c.*

order of generation. To explain: According to order of generation, the faculties are considered in their passage, so to say, from one substantial form to another. Thus, the nutritive faculties in the vegetative soul prepare the way, by helping to evolve the organization, for the operation of the sensile faculties in the animal soul; and they virtually remain in the latter, becoming with it, as it were, Subject and material cause of the said faculties of the sense. Therefore, though these various groups of faculties remain in the virtuality of the human soul; yet in the order of generation they are ranged under their own respective forms,—to wit, the substantial forms of those specific natures to which they belong as properties. Thus, the faculties of nutrition and growth belong properly to the vegetative form; and, in the order of generation, (as there has been occasion to remark before), these faculties together with the organized body may be regarded as Subject, or material cause, of the animal soul with its own proper faculties of sense. The animal body in turn, with its faculties of sense, nutrition and growth, may be regarded as Subject of the human soul with its proper faculties of intellect and will. But this order would take us out of our road; for the present inquiry is touching the dependence of one faculty on another in their common Subject, with the view of determining the nature of the dependence of the faculty on the essential nature to which it belongs. This is to be discovered in the order of nature alone. St. Thomas is here again a sure guide. Against the doctrine he defends,—viz. that the faculties have a dependence on each other, so that one may be said to spring from another,—he proposes to himself this difficulty: 'It seems as though one faculty cannot spring from another. For, in every case wherein entities are simultaneously existent, one cannot spring from the other. But all the faculties are simultaneously in the soul by creation. Therefore, one cannot spring from another.' Here, any introduction of the order of generation would be quite beside the mark. Accordingly, the following is the Angelic Doctor's reply: 'Although they are simultaneous, so far as time is concerned; nevertheless one is prior to another *in order of nature*[1].' But the order of nature suggests of itself a

[1] '(1) Videtur quod una potentia non oriatur ex alia. Quaecumque enim simul sunt, unum ex altero non oritur. Sed omnes potentiae simul sunt in anima ex creatione. Ergo una non oritur ex alia.

'Ad primum ergo dicendum, quod quamvis sint simul tempore, nihilominus tamen una naturaliter prior est altera.' 1 *d.* iii, *Q.* 4, *a.* 3, 1^m.

metaphysical dependence; just as the order of generation suggests a physical dependence. Let us briefly reduce to a connected whole that which is gathered from the teaching of the Angelic Doctor. All the faculties of the soul are produced simultaneously, being concreated with the soul which is their Subject. Hence, no one of them is really and physically Efficient Cause of another. Yet, there is such a dependence of some sort or another between them, that one may be said to be, as it were, active principiant of another. Of what nature, then, is this dependency? It is not a dependence arising out of a gradual generative evolution. For the faculties are the partial term of a Creative Act, and their production is simultaneous. It is not the dependence of a mere accident on its Subject; because this connotes a physical causal efficiency. What are we definitely to understand by this dependence? St. Thomas replies, that it is the dependence of the less perfect on the more perfect, as instruments of one and the same form,—the dependence of an entity on its proximate final cause,—the dependence of that which is further from the fountain-head on that which is nearer[1]. Finally: It is a consequent dependence of operation; for, as the Angelic Doctor says, 'those faculties which are ordered in the two other ways'—that is to say, according to order of generation and that of nature—'are so constituted that the action of one depends on another[2].'

Now, let us apply these principles to the parallel case of the faculties in their relation to the soul. Every faculty of the soul—and this, be it remembered, is according to the confession of Suarez equivalent to every property of a substance—is concreated with the soul; as, in the instance of purely material forms, the faculties are produced simultaneously with their Subject. Hence, the soul exercises no physical causal efficiency in the production of any of its faculties. Yet there is such real dependence of the faculties on the soul, as to justify the affirmation that the soul is, after a certain sort, active principiant of its faculties. But how are we to understand this *after a certain sort*? Notice, then, that the faculty is essentially dependent in its entire entity on the soul. It cannot *de potentia absoluta* exist, without the previous existence of the soul,—previous, that is, in order of nature. But this, it may be urged,

[1] 1ae lxxvii, 7, *c*, *init.*

[2] 'Illae autem potentiae quae ordinantur secundum alios duos modos, ita se habent quod actus unius dependet ab altera.' *Ibid. a.* 4, 3m.

is common to all the other accidents, which notwithstanding postulate the causal action of their Subject. In the first place, the above proposition is not true. It is not impossible for accidents to exist without their substantial Subject *de potentia absoluta*, but only *de potentia ordinata*. But, in the next place, even if true it would be irrelevant; because this absolute dependence of the property on its essential Subject has been mentioned, to explain why St. Thomas admits that the soul is, after a sort, active principiant of its faculty, though exercising no physical efficiency towards its production, as has been proved in the last Proposition. Be it further observed, that the subservience of the faculty to the soul in operation is *sui generis*. The dependence is so intimate, that it goes far beyond the strict concept of an instrumental cause. The action of the faculty is the action of the soul itself, considered in its potential integrity. It is not so truly the soul thinking by its intellectual faculty, as the soul thinking in its intellectual facultativeness. The two are inconceivably one in their union. The faculties of the soul are the soul itself in its integral perfection, as proximately capable of its second act.

Wherefore, God creates the human soul in its potential integrity. His adequate creative Act is virtually equivalent to certain partial creative Acts with their respective terms. In other words, He creates by His one Act the soul and each one of its faculties according to the essential nature of each constituent. The soul in its essential nature is created *absolutely*, and in intention primarily. The intellectual faculty is concreated *as a faculty*, essentially and immediately dependent in its character of accident on the essence of the soul as its Subject. In like manner, the faculties of sense are, so to say, concreated in their mediate dependence on the soul through their immediate dependence on the intellectual faculty. Precisely the same occurs in the instance of the other faculties. One further observation must be made, in order to obviate a possible misconception. The Creative Act is not terminated to the faculties as to distinct physical entities, in the way that matter and form were concreated in the elements. They are concreated as a natural result,—as the proximate potentiality of the soul to its second act. They follow of metaphysical necessity on the creation of the soul. Still they *follow*; and this is their resultance. When it is said, then, that they are partial terms of the Creative Act, the expression must be so understood. They are

terms, because they are metaphysically necessary and Divinely intended consequences. The same, *servatis servandis*, is to be said of the properties consequent on the generation of any whatsoever substance. They are the necessary results of the production of the essential nature.

Corollary.

Suarez has accused Cardinal Cajetan of not revealing to his readers, what the nature of this said resultance definitely is; although in the *Commentaries* of this learned and acute Dominican on the Angelic Doctor, it would seem as though his meaning could be gathered with sufficient clearness. However, in order to avoid a like imputation, let us here set down what we understand St. Thomas to have intended by the term. The concept, then, of *resultance* is partly negative. Considered negatively, it includes two points: (i.) The property, as resultant, is not the direct term of causal action, either creative or productive; but is the absolutely necessary consequence of the creation or production of its Subject. (ii.) Accordingly, it is not the effect of any real causal action of the substantial form to which it belongs. Considered positively, it comprises three points. (iii.) The property, as being a resultant, is posterior in order of nature to that substance of which it is the resultant. (iv.) Consequently, the property is essentially dependent on, and *de potentia absoluta* inseparable from, the substantial form to which it belongs both in its entity and in its existence. (v.) The substantial form is *de potentia absoluta* inseparable from its property; so that, if the former is created or produced by natural generation, the latter is *ipso facto* concreated and (if the expression may be allowed) comproduced by the same natural generation, with its essential dependence of entity, existence, and of operation.

DIFFICULTIES.

I. There are not a few expressions of the Angelic Doctor, which seem to denote very plainly that, in his opinion, a property is produced by the distinct causal action of the substantial form to which it belongs. Thus, for instance, he says: 'All the faculties of the soul, whether their Subject is the soul alone or the composite,'—sc. of soul and body, referring to the distinction between the spiritual and the lower faculties,—'flow from the essence of the soul as from

a *principiant*; for it has been already remarked that an accident is *caused* by the Subject accordingly as it is in act, and is received in it' as in a Subject 'accordingly as it is in potentiality[1].' Again: 'All the faculties of the soul are related to the soul alone, as to their principiant[2].' Again: Speaking of the separated soul after death, he declares it to be 'of such virtue that, if united to the body, it can again *cause* these faculties, just as it can life also, in the body[3].' But, if it can cause them again, it must have caused them before. Once more: 'The faculties of the soul may receive the name of essential properties, not because they are parts of the essence, but because they are caused by the essence[4].' Lastly: Suarez objects that the passages quoted do not prove our conclusion; because St. Thomas 'does not assert that the accidents' (properties) 'flow from their subject apart from any action, but that they do not do so by any transmutation, but by natural resultance[5].'

Answer. All the passages brought forward are reducible under two heads. In the one class St. Thomas calls the soul the *principiant* of its own faculties; in the other he describes these faculties as being *caused* by the soul: A word or two about each. (i.) As foundation of the reply to be made in regard of the first class, four brief passages from the *Summa* shall be submitted to the reader's attention. 'The very fact of the accidental form being a principiant of action, it owes to the substantial form. Wherefore, the substantial form is the primary principiant of action, though not the proximate[6].' Again: 'All the faculties of the soul are attributed to the soul, not as Subject but as principiant;'—for the soul is the one only Subject of the spiritual faculties alone, the substantial composite is Subject of the rest;—'because the

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[1] 'Omnes potentiae animae, sive subjectum earum sit anima sola, sive compositum, fluunt ab essentia animae sicut a principio; quia jam dictum est quod accidens causatur a subjecto, secundum quod est actu; et recipitur in eo, inquantum est in potentia.' 1ae lxxvii, 6, *c.*

[2] 'Omnes potentiae animae comparantur ad animam solam sicut ad principium.' *Ibid. a.* 8, *c.*

[3] 'Quia anima separata est talis virtutis ut si uniatur corpori, iterum potest causare has potentias in corpore, sicut et vitam.' *Anima, a.* 19, 2m.

[4] 'Potentiae animae dici possunt proprietates essentiales, non quia sint partes essentiae, sed quia causantur ab essentia.' *Spiritu, a.* 11, 5m.

[5] *Metaph. Disp.* xviii, § 3, *n.* 5.

[6] 'Hoc ipsum quod forma accidentalis est actionis principium, habet a forma substantiali; et ideo forma substantialis est primum actionis principium, sed non proximum.' 1ae lxxvii, 1, 4m.

body owes it to its union with the soul, that it is capable of eliciting such operations[1],'—to wit, the vegetative and sensile operations. Once more: 'All faculties of this sort are in the soul, so to say, before they are in the composite, not as in a Subject but as in a principiant[2].' Lastly: He speaks of the soul as '*virtual* principiant of this class of faculties[3],'—that is to say, principiant in efficacy. The reader will doubtless remember, that in the first Chapter of this Book it was shown, how that the term *principiant* is generic, and that not every principiant is a cause, much less an Efficient Cause. Now, the question arises, in what sense the term is employed by St. Thomas relatively to the soul and its faculties. The passage just quoted will serve as a guide. The human soul is principiant of all its faculties, inasmuch as it is the principle in all their operations. These operations are nothing more or less than the soul itself in its second act. But this explanation only takes us half-way. Wherefore: Because the faculties belong to the potential integrity of the soul, though claiming no place in its essence; they are its properties. Consequently, they are in their very nature essentially dependent on the soul; whereas the soul in its essential nature is not dependent upon them. The soul is final cause of the faculties; but the faculties are not final cause of the soul. Once again: The faculties entitatively trace their origin to the soul, flow from it, form its active potentiality. Hence, the soul not only has a priority of nature; but is the spring out of which the faculties issue. It is for these reasons, that it vindicates to itself with justice the title of principiant. But there is nothing here to warrant the conclusion, that the essence of the soul, because it is termed principiant, must therefore exercise real causal action of any sort in the production of its faculties. (ii.) This leads us to the second class of passages that are urged against the truth of our present contention. The first of the citations couples the term, principiant, with the *causality* of the soul in relation to its

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[1] 'Omnes potentiae dicuntur esse animae, non sicut subjecti sed sicut principii; quia per animam conjunctum habet quod tales operationes operari possit.' *Ibid. a.* 5, 1^{m}.

[2] 'Omnes hujusmodi potentiae per prius sunt in anima quam in conjuncto, non sicut in subjecto, sed sicut in principio.' *Ibid.* 2^{m}.

[3] 'Quia anima manet immutabilis, quae est virtuale principium hujusmodi potentiarum.' *Ibid. a.* 8, 3^{m}.

faculties, and explains the former in the sense of the latter. What is to be said of the fact, that St. Thomas attributes to the essence of the soul a causal efficiency in the production of its faculties? The following seems to be the true answer, according to the mind of St. Thomas. Causality may be of two kinds,—viz. physical and metaphysical. Physical efficient causation, as will be seen later on, is really the effect in the Subject of action, connoting a dependence on the agent. But metaphysical causation consists in the essential dependence of a result on its principiant; which may exist without distinct physical action. This important distinction will be more fully explained, when we come to examine the other objections of Suarez. Meanwhile, in the passage now under review, it is manifest that St. Thomas is limiting himself to the metaphysical order. For, in the same Body of the same Article from which the quotation has been made, and to which St. Thomas invites attention in the quotation itself, he thus explains his meaning: 'Hence, it plainly appears that actuality is discovered in the substantial form, before it is found in the Subject. And since that which is first is cause in whatever Category; the substantial form causes actuality of being in its Subject. But on the contrary actuality is discovered in the Subject of an accidental form, before it is found in the accidental form. Hence the actuality of the accidental form is caused by the actuality of its Subject, in such sort that the Subject, as being in potentiality, is receptive of the accidental form; as being in act, is productive of it[1].' Here it is plain that the productive causality mentioned is not physical; and this for three reasons. First: It depends solely on the actuality of the receptive entities, as involving simply a priority of nature. Secondly: So far as the causation is considered as physical, in one of the two instances alleged it is formal, not Efficient Causality. Yet the term *cause* is applied indifferently to both instances, with the manifest intention to draw a parallel between them. Thirdly: The priority, in actuation, of the substantial form is evidently not a physical,

[1] 'Unde patet quod actualitas per prius invenitur in forma substantiali quam in ejus subjecto. Et quia primum est causa in quolibet genere, forma substantialis causat esse in actu in suo subjecto. Sed e converso actualitas per prius invenitur in subjecto formae substantialis quam in forma accidentali; unde actualitas formae accidentalis causatur ab actualitate subjecti; ita quod subjectum, inquantum est in potentia, est susceptivum formae accidentalis; inquantum autem est in actu, est ejus productivum.' I^ae lxxvii, 6, *c.*

but metaphysical priority. In the case of properties, the priority of the Subject is likewise not physical but metaphysical; and of these it is that St. Thomas is expressly treating. Indeed, if we look attentively to these passages in their connection and general scope; they afford a signal confirmation of the opinion here maintained. The Thesis which St. Thomas proposes to establish is, that *the faculties of the soul flow from its essence;* and his demonstration may be thus paraphrased: In the integral perfection of the soul considered as a potential whole, the essence is the first in act according to the order of nature. But that which is first in act is, metaphysically speaking, cause of all the rest in the same whole. Therefore, the essence of the soul is the cause of its faculties; or—in the words of the enunciation of St. Thomas—the latter flow from the former. Surely, there is no question of physical causation here. The other quotations are subject to the same interpretation. But there is one of them, (the third, taken from the nineteenth Article of the Question *De Anima*), which calls for particular notice, as affording a remarkable confirmation of the very doctrine against the truth of which it has been brought forward in evidence. St. Thomas is there discussing the question: *Whether the faculties of sense remain in the soul after its separation from the body;* and he concludes that they are destroyed after death, but remain in the soul as in their principiant and root,—that is to say, virtually. He then proposes to himself this, among other difficulties: 'To be in anything as in a root, is to be in it potentially; which is tantamount to being in a thing virtually and not actually. But the essentials and natural properties of an entity must necessarily be in the entity actually, and not virtually only. Therefore, the faculties of sense do not remain in the soul after death, only as in their root[1].' To this objection the Angelic Doctor replies: 'These faculties are said to remain in the soul after separation from the body as in their root; not in the sense that they are actually in it; but,[2]'—and here follow the words quoted in the objection. In order fully to understand this answer

[1] '(2) Sed dicendum quod remanent in ea ut in radice.—Sed contra, esse in aliquo ut in radice, est esse in eo ut in potentia; quod est esse in aliquo virtute, et non actu. Essentialia autem rei et proprietates naturales ejus oportet quod sint in re actu, et non virtute tantum. Ergo potentiae sensitivae non remanent in anima solum ut in radice.'

[2] 'Ad secundum dicendum, quod hujusmodi potentiae dicuntur in anima separata remanere, ut in radice, non quia sunt actu in ipsa; sed' etc.

of St. Thomas, it behoves us to know his teaching with regard to these lower faculties of the soul. According to him, then, and the Scholastic Doctors generally, these vegetative and exclusively animal faculties do not inhere in the soul alone as their Subject, but in the soul, together with the special organ of the body that is their instrument. It follows, therefore, that when the soul is separated from the body, these faculties cease, or are destroyed; because their adequate Subject no longer exists. What, then, is their relation to the separated soul according to St. Thomas? He evidently admits that, as properties, they must either *actually* exist in the soul or not at all. There is no virtual existence in the principiant possible. This is a great admission, as bearing on the present contention. But how, then, are they *caused* anew, should there be a resurrection? St. Thomas replies: By the virtue existing in the soul to renew them. But of what nature is this virtue? Again St. Thomas replies: The same virtue which restores life to the dead body; and operating in the same way. But how does the soul restore life to the body after reunion? By informing it again. Mark, then, the inevitable inference. Is the life restored to the corpse the result of any distinct causal action, or is it the inevitable result of the soul once more informing its body? Who would be so mad as to maintain the former hypothesis, involving—as it does—so many metaphysical absurdities? Therefore, life is the necessary result of information. Hence, as St. Thomas compels us to conclude, the resolution of the lower faculties follows likewise by natural resultance. But how is this to be explained? Thus: The lower faculties are the property of the composite substance,—of soul and body in union. When, then, the composition is destroyed by death, they are destroyed; and when the composition is restored, they are *ipso facto* restored, without any need of distinct causal action. Lastly: They are said to remain in the virtue of the soul objectively; because the soul is act of the body, and, as such, lord paramount of all its specific properties.

It only remains to consider the last instance of Suarez against the argument derived from the authority of St. Thomas. It is true that St. Thomas does not expressly affirm in so many words, that the emanation of the faculties of the soul is without distinct causal action; but (as has been shown) he virtually says as much over and over again. If these are connected with the soul by God;

they cannot be the effect of finite causality. If they are produced without any transmutation of their Subject; there can be no distinct causal action. If they are caused, as life is caused in a resuscitated body; they postulate no Efficient Cause, but rather on the contrary exclude one.

II. Suarez offers the following objection. The said resultance either is a true and proper efficiency, or is no efficiency at all; for there is no middle term. If it is a true efficiency; it is causal, and connotes causal action. If it is not a true efficiency; it is not a resultance, (or natural causal sequel), but rather an inferred sequel,—that is to say, on the supposition of the one, the other is supposed by natural due.

Answer. The first Member of the *Antecedent* must be distinguished: *The said resultance is either a true* physical or metaphysical *efficiency or etc.*,—granted; *either a true* physical *efficiency or etc.*, there is need of a subdistinction: a *true* physical *efficiency* distinct from the causal action by which the Subject is produced,—denied; included in, and identical with, such causal action,—granted. The first Member of the *Minor*,—viz. *If it is a true efficiency, it is causal and denotes causal action*,—must be contradistinguished: *If it is a true* metaphysical *efficiency, etc.*,—denied; *if it is a true* physical *efficiency*,—a subdistinction: *If it is a true* physical *efficiency* distinct from the causal action, by which the Subject is produced,—granted; *if it is a true* physical *efficiency* that is identified with such action,—denied.

The second Member of the *Minor* in like manner needs a distinction: *If it is not a true efficiency* in any of the senses indicated, *it is not a resultance*,—granted; *if it is not a true efficiency* distinct from the causal action by which the Subject is produced,—Suarez forces us to make a subdistinction: According to the meaning which Suarez has attached to the term,—granted; as the word is ordinarily understood, and as it is employed by St. Thomas,—denied. Suarez has inserted a parenthetical definition which begs the whole question; as may be seen by looking at the words italicized in his stated objection.

The *consequent* is denied in the sense of the distinction given.

III. The next argument of Suarez is not in form. He objects as follows: 'Some appear to assign a middle term between these,'—that is to say, the two horns of his dilemma,—'by affirm-

ing that this resultance is not an efficiency, but a *quasi*-efficiency which consists exclusively in this,—viz. that the cause which produces the substance is determined, (or receives a direction), on account of the latter, towards bestowing on this latter the properties proportioned to it. But, in the first place, this is in truth no efficiency; but only connaturality, such as intervenes between a natural passive potentiality and its act. Then, again, the instance of the return of water to its pristine coldness, compels us to acknowledge a greater and truer efficiency. Lastly: Assuming the truth of the hypothesis, it is necessary to admit, (which is the point in question), that the cause which produces the substance produces concomitantly the distinct property, not however without an accompanying action; because it is contrary to reason, that a distinct entity should be made without a distinct action, when the said entity does not enter into the constitution of the primary term of the original action. The reason is, because action is only a certain mode of the formal and absolute term.'

Answer. The above difficulty might have been passed by without notice, because it does not directly touch the opinion here advocated,—viz. that there is neither (physical) efficiency nor *quasi*-efficiency in resultance. However, as some of the reasons alleged do indirectly impugn the position maintained in these pages, and animadversions on these may have the effect of throwing new light on a confessedly difficult problem; let thus much be said. (i.) Objection must be taken to the phrase, 'is determined by the *giving* to it of the properties,' etc. For *to give* connotes action and, in its present connection, causal action; which is precisely the point in dispute. (ii.) Suarez complains that, according to the explanation of a *quasi*-efficiency (which he is refuting), *a resultance is in truth no efficiency.* It is not contended, here at all events, that it is. If the expression, *quasi*-efficiency, is to be admitted at all; it can only be in the sense, that it depends upon the causal action by which the Subject of the property is produced. (iii.) Suarez adds that *it is only connaturality, such as intervenes between natural passive potentiality and its act.* This is denied. It is not mere connaturality, but connaturality with an essential non-mutual dependence. To explain: Primordial matter and the substantial form, according to the teaching of the Angelic Doctor, are concreated in the elements, or simple bodies; but they are mutually

dependent. Hence, the creative act is terminated to each directly. For they are both in the Category of Substance,—half essences with their own partial nature and partial existence. But the case of essence and its property is quite different. In the first place, as St. Thomas repeatedly reminds us, accidents in general are *quo* rather than *quod*;—in other words, they are rather that by which another thing (their Subject) is, than something in themselves. Properties, in particular, belong to the physical integrity of the nature which is the term of causal action; and their dependence on their Subject is absolute. But it is the substance in its physical integrity that is the adequate term of physical efficiency. If an illustration must be taken from the creation of the simple bodies; there is one that is more germane to the subject. The constitution of the corporal substance is the result of the information of the matter by the substantial form. There is, moreover, another marked difference between the two terms of the comparison of Suarez. In the constitution of corporal substance there is a physical formal causality; in the case of an essential nature and its property, though there is a real, there is not a physical, formal causality. If there were, there must be likewise physical composition. (iv.) The next argument of Suarez is derived from the phenomenon of the return of water that has been heated to its natural coldness, when the Efficient Cause of its heat has been removed. Arguing in accordance with the physics of his day, he urges that the property of cold, expelled by the action of the fire, is brought back by the causal action of the substantial form of the water. If our reply must be from the same physical point of view, let it be that of Cajetan. The property of cold remains, spite of the heat; but is hindered by the latter from continuing its action. So then, the impediment once removed, the property resumes its action. Hence, there is no room for any causal action of the substantial form. But the argument may be dismissed; for it is not worth much, more particularly in the light of modern physics. (v.) The last argument of Suarez demands more careful consideration. He says, in effect: 'Let us suppose for the sake of argument, that your explanation is the true one; you cannot even so escape from the necessary intervention of a distinct causal action. For action is really nothing else save a mode of the entity produced. But, if there are two distinct entities, (which you do not pretend to deny); even though the Efficient Cause produces both simultaneously by natural

concomitancy, yet there must be two distinct actions, because there are two distinct terms; unless, indeed, you are prepared to maintain that the property enters into the intrinsic constitution of the essential nature.' If we attentively consider this plausible objection, it will be seen that it is resolved by distinguishing the term, *distinct*. If a real physical distinction between the essence and its property be once admitted; it seems impossible to deny the justice of the conclusion of Suarez. But, maintaining,—as we do,—that the distinction, though real, is metaphysical, the argument loses its entire force. Though the faculties—to resume the old and most conspicuous instance—form no part of the essence of the soul; they, notwithstanding, form an essential part of its physical integrity, as an entity proximately capable of its second act of natural operation. A non-potential soul will not endure as a term of thought; how, then, can it become a distinct term of physical causality? In the instance of the properties of other purely material substances that are the effect of natural generation, there is besides a seeming contradiction in the hypothesis as stated by Suarez. For in this case, the property is supposed to be caused by the substantial form. It therefore must be, that the form should physically exist without its property; since in all finite efficiency there is succession and, consequently, time. How, then, could the existence of the two be simultaneous?

A General Survey.

It is certain that, in this as in other philosophical problems, considerable light may often be thrown upon the subject, by recurring to the use of words in the ordinary acceptation of common life. If we turn, then, to the every-day use of the term, *result*, as distinguished from an effect properly so called; we shall find that it very often designates something that is not the effect of any distinct causal action. Thus, for instance, the fire makes the water boil; and the result is that it *boils over*. There is no distinct causal action of the fire. It communicates such a degree of intensity of heat to the water, as to cause it to boil; but it does nothing beyond, and distinct from, this to cause the overflow. This latter is a natural consequence or (if you will) concomitance. So again: The seal that leaves its impress on the wax, by the same efficiency,—that is, by the same imparted pressure,—*cools* and *hardens* it. We hear it stated, that *the election has resulted in the return of the conservative candidate*. Here, again, there is no new or distinct causal action. The electors

have recorded their votes; the voting has resulted in the said return. The same meaning appears, when the term is used arithmetically. There is no more entity, so to speak, in 4 than in $2+2$, or in 20 than in 5×4; yet the former are called results of the latter. Once more: The resultant of forces in geometry is no new physical force, but represents the combined action of the separate forces in direction and intensity. It cannot be denied that the term is frequently identified with *effect* in ordinary conversation; but this does not hinder the fact, that it is also used with a meaning peculiar to itself. And, thus used, it signifies an effect either essentially or connaturally included in another effect, requiring accordingly no distinct causal action for its production. It is in this way precisely that a result is distinguished from an effect; resultance, from efficiency or effectuation. In all these cases, the result is necessarily dependent upon that of which it is the result.

Now let us return to the problem which we have just been engaged in solving; and gather into a summary the results of the inquiry. If we accept the statement of the Angelic Doctor, that the existence of the soul without its higher faculties is impossible and inconceivable,—and who that has thought at all about it could determine otherwise?—we must be prepared likewise to accept certain conclusions that immediately follow from it. There cannot be a physical distinction between the two, according to the received acceptation of this term; otherwise, they would be capable of separation *de potentia absoluta*. Even primordial matter, most imperfect of entities as it is, can be separated from any particular form; though it cannot exist without some form. They are, however, really distinguished; as is patent from the fact that the soul is a substance, while the faculties are accidents. This has been called a real metaphysical distinction; and the appellation is not without its merits. But it little matters by what name it may be called, provided that two things are distinctly understood; to wit, that there is a real distinction of some kind, yet on the other hand that the two are inseparable *de potentia absoluta*. In a similar way, figure is inseparable from quantity, though the two are in separate Categories; consequently, when the quantified body is divided, new figures result by natural concomitancy. It follows, further, that the soul cannot exercise any real causal action towards producing its faculties; because, in such case, their separation could never amount to a metaphysical impossibility. For the physical

action of second causes could never transcend the limits of physical certainty. That which is concluded of the faculties of the soul is *à pari* concluded of every property in relation to the essence. It further follows, that (as St. Thomas teaches) the soul and its faculties must have been concreated by God,—the latter as a necessary result of the former; or—to put it more generally—that the property must be *comproduced* by one and the same Efficient Cause which produces the Subject, and produced as a natural consequence of the production of the latter. Finally: It follows that the property does not require any distinct action of the Efficient Cause for its production; because, on the production of the essential nature, the faculties accompany it by a metaphysical necessity. They are the partial constituents of the soul, considered as physically integral and as a potential whole. It is impossible to conceive of a nature being constituted in its first act of being, without its being at the same time proximately capable of its second act of natural operation. Nevertheless, the property is produced in harmony with its nature; that is to say, it is *comproduced* as an accident, having an essential dependence on its Subject, so that it is rooted in such subject, and flows from the same as from its source. This special manner of production is called resultance by St. Thomas and the School. For these reasons, the essence may be metaphysically called the Efficient Cause of its property; since it is necessary and sufficient for the resultance of the property, and the latter is essentially dependent upon it for entity and existence.

Scholion.

Suarez, spite of his opposition to the doctrine of which a summary has just been given, seems in one place to grant almost all that we postulate. For, instituting a just distinction between two different kinds of resultance, he thus speaks of the kind which has been investigated in the present discussion: 'When the effluence of the accident from its Subject is such that it can never be caused absolutely or separately, but only in connection with the former action' by which the Subject is produced, 'and with the term of such action; in this case, it is not considered as properly and absolutely action, much less a change, but is as it were an accidental complement of the prior action.' One can hardly perceive more than a verbal difference between the above declaration and the teaching of St. Thomas on the subject, as explained in the preceding pages.

PROPOSITION CCLIV.

Whenever an accident is produced otherwise than by natural resultance; the proximate principiant of its production is always some accident.

This Proposition is proved,

I. *From induction.* (i.) To begin with the simple bodies or elements: Ozone is considered by chemists to be an allotropic form of oxygen; so that the two, according to this hypothesis, must be substantially the same. Yet they differ in their action on the senses of smell and taste. Oxygen has no perceptible effect on either; while ozone pronouncedly affects both. Wherefore, that in the ozone which produces in us these impressions of sense, must be an accident; for, if it were substantial, oxygen would produce the same impressions as ozone. Again: Some elements in their normal condition are solid, others liquid, others again gaseous. But these and other like qualities, by which these elements produce accidental changes in ourselves and other entities, are not substance. For almost all of them are capable of being altered from one state into another. Sulphur, for instance, becomes liquid by the application of heat, and changes its colour in the operation; which justifies us in inferring that this latter accident is caused by the accidental form of heat. Take another very striking instance: A piece of soft iron, if placed without actual contact within a coil of copper-wire through which an electric current is made to pass, becomes magnetic. As soon as the current ceases, its magnetic force ceases likewise. The soft iron is not in this instance a mere medium; because the coil is not itself magnetic, though the electric current passes through it. If a piece of steel, or tempered iron, is subjected to the same process; it becomes permanently magnetic. Here we have an instance of an accident introduced into an element by an external agent, as well as a curious illustration of a difference of capacity, in one and the same substance, for naturalizing (so to speak) one accident by means of its previous information by another accident. (ii.) If we now turn to compound inorganic substances; we shall come across the like phenomena. Water receives the accidental form of heat from fire, and by means of this accident becomes most useful in the kitchen and lavatory. Salt by the action of time will lose

its savour; so that the accidental changes of flavour etc., which it causes in us and in other bodies, are produced by that which is accidental to the substance itself. In like manner, if medicines are kept beyond a certain time; they lose more or less of their virtue. But if this virtue formed any part of their substance; it could not admit of more and less, which is a characteristic of accidents. (iii.) We now arrive at a very curious class of phenomena, and one of considerable importance in its bearings on the present inquiry. Reference is made to organic substances that are no longer informed with life. They are not the same substances that they were before. Life has gone out of them. A substantial transformation has taken place. As the Scholastic philosopher would say, the living form has made way for the regressive form of a lifeless compound, and with it the properties of a plant have gone,—its faculties of reproduction, growth, assimilation. Yet there are accidents that belonged to it when living, that remain in the dead substance that has replaced it. The poison of venomous plants remains: So do flavours, as of pepper and mustard. There are medicinal virtues in certain plants, which are often more efficacious after the plant has ceased to live. Rose-leaves and lavender retain their fragrance of smell. So does the musk of the male musk-deer. If any of these qualities formed part of the substance of the living thing; it could not have survived the change. Again: These organic compounds suffer equally with the inorganic by lapse of time; nay, more so, in consequence of the complexity of their combination. Bakers would not thank you, if you should provide them with barm that had gone flat. Milk, kept too long, becomes sour. (iv.) Let us now proceed to the phenomena of plant-life. It is said that some flowers give out their sweet odours only in the evening. Some species of fungi are edible in one country, that are poisonous in another. The same plant is nutritious food in one part of its organism, and venomous in another. Thus, the potato-apple, or fruit of the potato, is poisonous. So again the corn crowfoot, a species of ranunculus, is the most venomous of its kind; yet its seed is the favourite food of partridges. Again: The same plant may be nutritious or hurtful under varied circumstances. Thus, celery if green is poisonous; if bleached, harmless. The tomato and egg-plant, which are both largely used in cookery, belong to the same family as the potato and nightshade; and are noxious

till cooked. Once more: Take the fact, that certain virtues abound in one part of the plant more than another. It is for this reason that the root of rhubarb, the leaves of senna, the seeds of the croton tiglium are selected by the druggists. To proceed, however, to the higher and more characteristic functions of vegetative life: If the organs of sexual reproduction formed any part of the essence of a plant; they would not be wanting in some of the lower plants. Neither could there be those variations in them, that are common facts of observation. Plants would not be, some monoecious, others dioecious, others polygamous; and their flowers would not be sometimes hermaphrodite, sometimes unisexual. Further: If these organs were included in the essence, no plant could be without them for so long as it is a plant; yet the reverse is notoriously the fact. But if the organs form no part of the essence, neither can the faculty of reproduction itself; because, as being purely material, the faculty can only exist, on the supposition that the corresponding organs exist. The faculty, therefore, is a property of the plant; yet it supplies us with the fruits of the table. To continue: As an ordinary rule, (for it is not without its exceptions), the leaves, inclusive of the chlorophyl which they contain, are the normal organs of an assimilation which is necessary to growth. Yet the leaves of deciduous plants (which constitute the greater number) are wanting for nearly half the year,—in our country at least. Hence it is concluded, as before, that neither the faculty nor the organs of assimilation form any part of the essential nature of the plant. But these are the distinctive faculties that are causes of the principal phenomena characteristic of vegetative life. Therefore these accidental phenomena are the effects of a property of the plant produced by natural resultance. (v.) That which facts of daily observation have justified us in concluding with regard to the reproductive, assimilating, and crescent faculties of plants, we may fairly conclude likewise touching the same faculties in the animal. For, though in the latter the phenomena present certain peculiar differences, consequent on the superiority of the substantial form; nevertheless, in the points indicated, they offer a striking resemblance to those of plant-life. The faculties of sense agree with those of reproduction, assimilation, etc., in this; that no one of them can exist or function without a bodily organ. But the organs are sometimes wanting, sometimes—as in the case of the

eyes of puppies for some few days after birth—cannot function, sometimes are destroyed either by disease or violence. The same argument, therefore, applies to them as to the preceding—they are accidents of the essence. (vi.) It is generally conceded, that those entities in bodies, which produce all the impressions on the organs and faculties of sense, are, not the substances themselves but their accidents. (vii.) In the instance of the two spiritual faculties of the human soul, from the nature of the case, we are not provided with like facts from which we can draw a like inference. We can only, therefore, argue from analogy, that it is the same with them as with the other faculties,—viz. that thoughts and volitions are the effects of faculties which form no part of the essential nature of the soul.

II. The Proposition is proved by a deductive argument founded on the above induction. Every operation of a substance (with the one exception of substantial generation) either disposes for the act of substantial generation, or it does not. Now, that operation which prepares the way for substantial generation postulates an accident as proximate principiant, for the reason that the disposition of the matter is itself accidental. For if the new substance is such that it cannot be generated without these previous accidental dispositions; it is reasonable to infer that the generating substance, which is of the same specific nature, should postulate similar accidental dispositions to correspond with such results. On the other hand,—so far as experience goes,—all the natural operations of substances that do not dispose towards substantial generation, are either operations of vegetative or animal or intellectual life, or different kinds of local motion. These four varieties of operation shall be treated separately.

i. All the operations of vegetative life tend towards that which may be called a substantial aggeneration. Hence, they almost seem to fall under the same Category as the primitive generation; and are thereby shown to require previous alterations and accidental dispositions, with certain local motions of attraction and repulsion. In fact, the vital movements in vegetative bodies—with the exception, perhaps, of those that are reproductive—seem to be similar to those effected in inorganic bodies by their interaction. On this point Suarez has a profound observation. 'The actions of the vegetative soul,' he writes, 'are substantially of the same nature as those which are produced by an external principiant.

For they are all either local movements, or alterations, or the eduction of the substantial form. Hence, they assume the nature of vital action, from their special relation to the plant-soul as to a principiant in the same supposit, that is endued with self-motion[1].' We can thus admit the appropriateness of the analogy contained in such expressions as, v. g. that gases are *generated*, and crystals *grow*. Now, if these operations fall under the same category as that of the primitive generation; the argument already instituted elsewhere will equally apply to both. The *transient* actions of plants—that is to say, their actions on other bodies—are effected by means of qualities which are evidently, as we have seen, no part of the substantial essence.

ii. That the operations of sensile perception and of sensile love in animals require accidental forms as their instrumental and proximate principiant, is established by the following reasons. First of all, it may be gathered from the variety of operations and of dispositions as well as from the great diversity of organs. There is the act of seeing and the eyes for organ, the act of hearing and the ears for organ, the act of locomotion and the limbs for organ, and so on for the rest. Now, it constantly happens that these different operations are simultaneous. The same animal at the same time may be running, hearing, scenting, seeing, obeying, imagining, and the like. Yet it seems in the highest degree improbable that an animal form, which is purely material in origin and entity, should be capable unaided of eliciting all these distinct acts at one and the same time. It is tasking a mere act of matter beyond its natural stretch. Further: Why all this multiplication and exquisitely complex construction of organs; if the sensible soul is capable of all these acts exclusively by its own energy? Once more: If it is the animal soul exclusively that by its own *immediate* operation hears and sees and moves and imagines etc.; whence comes it to pass, that it cannot see with its legs and move with its nose from place to place, since it wholly informs the whole body? There is one further argument, based upon the same facts, which is of great cogency. On the hypothesis that these several operations proceed immediately from the substantial form; since they are in such sense immanent actions as to be limited in their effects to the Subject that elicits them, they would remain in the

[1] *Metaph. Disp.* xviii, § 6, *n.* 5.

substantial form alone and would be entirely independent of the body. The argument is further confirmed by the existence of these lower faculties in the human soul. For if the operations of growth and assimilation, of sensile perception and love, of locomotion, proceeded *immediately* from the soul of man as their only Efficient Cause; all of them would be spiritual. Nay, according to the hypothesis in question, they would be purely spiritual acts in animals as well as in man; for every form that has its own proper action independent of matter, must in its being be independent of material conditions, which is tantamount to saying that it is spiritual. If it should be urged in reply to this argument, that the animal soul operates immediately indeed, but necessarily, in a bodily organ; it must be said that the same necessity, which limits a definite operation to a definite organ and postulates the instrumental causality of matter as a condition, postulates likewise the existence of diverse faculties corresponding to these organs. Accordingly, it is justly concluded that the sensile soul is not the proximate cause of these operations; but that they are elicited by the instrumentality of faculties, whose existence is limited to a particular organ of the body.

iii. By a similar deduction from the psychological facts of consciousness, and for metaphysical reasons that have been already given, it is concluded, that the spiritual operations of the human soul proceed from accidents as from their proximate principiants. First of all, we recognize in ourselves a great variety of spiritual acts. There are acts of the intellect and of the will. Then, of the intellect there are acts of consciousness, of understanding, of reason, of abstraction, generalization, faith, etc. Of the will there are wishes, deliberations (partly intellectual, partly volitive), choices, etc. But a finite spiritual substance is of itself indifferent as to the eliciting of one act rather than another. It seems necessary, therefore, that it should be determined and, as it were, proportioned to these accidental operations by accidental properties of its own. Hence, the common judgment of mankind ascribes to the human soul spiritual faculties and habits. Another cogent proof is derived from the substantial information of the body by the human soul. For the soul *as form* is the substantial act of the body in its entirety. But the operations of thought and volition are in their entirety quite independent of the body. Therefore, they cannot well proceed immediately from the soul, but from some superior faculties of the

soul, which are its properties by virtue of its spiritual nature. Once more: Every finite spiritual nature has of necessity an accidental spiritual operation, intellectual and volitive. For its intellectual operation, it stands in need of certain impressed species; for its volition, it needs a thought presentative of the object. But these species and thoughts are accidents. Therefore, it is natural to conclude, that the proximate principiant of these operations will be likewise accidents. Lastly: The essence of a spiritual nature, as such, is ordained to the first act of being. The proximate principiant, therefore,—to repeat an argument that has been used on a previous occasion,—must be an accidental form, or property. Such is a faculty.

iv. It is still plainer that the proximate principiant of locomotive operation is accidental. To begin with the locomotive forces proper to inanimate bodies,—that is to say, those forces by which one body is enabled to move another body from its place: Physical experiment and observation afford the strongest grounds for the conclusion, that these forces are accidental. One and the same piece of steel may be magnetized and afterwards demagnetized; and in the former state it exercises an attractive force on the needle to draw it from its place, while in the latter state it does not perceptibly possess any such force. In this and similar instances, it is clear that the force is not substantial. But by *à priori* demonstration we surely arrive at a like conclusion, which is equally applicable to this force in animate as in inanimate bodies. For it would seem removed from all doubt, that a principiant or cause, which is not incapable of ulterior perfectionating in virtue of its infinity, receives additional perfection from its causal action. That which has power to cause motion is surely perfected by the exercise of its power. But, in inanimate bodies there is this that is peculiar to their exercise of locomotive force. The act cannot but exist in another body extraneous to itself; since the act entitatively is the locomotion communicated to the Subject of such motion. But no inanimate body is capable of self-motion. This is a property of life. Hence it follows, that the locomotive force, in the case of inanimate bodies, is perfected by a certain accidental reality that is produced in another body. Accordingly, if the said force belonged to the essential nature of the motive body; these things would ensue. An essence would be mutable, capable of more and less of perfection, and dependent

for its perfectibility on the Subject of its action. It might perhaps be objected, that in such case it would be accidentally but not substantially perfectible. Such an explanation, however, could not be admitted; for that which is perfectible according to its essential nature, is perfectible only within the limits of its own category. But an active force is perfected in its own entity by its act. Wherefore, if the locomotive force were substantial; it would be substantially perfected by its act. Another objection may be made to this argument. It may be said that, though an active potentiality is perfectible by an immanent action, it is not capable of being perfected by a transient action; because the act is the effect, and the effect is not in the potentiality but in the Subject. For answer: The term of action belongs to both the potentiality and the Subject. As effect, it perfects the Subject; as act, it perfects the potentiality. If the above argument is valid; it would follow, in addition to the other anomalies pointed out, that a substance could be substantially completed by an accidental form.

If we now betake ourselves to the locomotive forces discoverable in living bodies; the above argument acquires additional force. For the locomotive force proper to such bodies is one of self-motion or, as it is often called, spontaneous motion. Now, nothing can move itself,—that is to say, impart at once and receive the same motion,—according to the same part of its entity. 'It is impossible,' says the Angelic Doctor, 'that anything should move itself; unless it is divided into two parts, of which the one imparts motion and the other receives it[1].' And again: 'As is proved in the eighth Book of the *Physics*, everything that moves itself is made up of two things, of which one is cause of motion, itself unmoved, and the other is moved. Now, an animal moves itself; but that which is cause of motion in it is the soul, and that which is moved is the body[2].' In the self-motion, therefore, of animals the locomotive action and the effect of the action are in the same substantial composite, though not in the same part of the composite. Therefore,

[1] 'Nec est etiam possibile quod aliquid moveat seipsum, nisi dividatur in duas partes, quarum una sit movens et alia mota.' 3^ae xxxii, 4, *c. a. m.*

[2] 'Sicut . . in octavo Physicorum probatur, omne movens seipsum componitur ex duobus, quorum alterum est movens et non motum, et alterum est motum. Sed animal est movens seipsum; movens autem in ipso est anima, motum autem corpus.' *Cg. L.* ii, *c*°. 65.

pursuing the same argument, it follows that, in one and the same substantial entity, one part—and that too, the form—is substantially perfected by that which in the other is purely accidental; for in locomotion the effect, as St. Thomas often declares, is not really a perfectioning of the Subject, since it only consists in a new ubication. But nothing can be more unreasonable than such a hypothesis. The above arguments are confirmed by previous conclusions. If the higher faculties of sense and the still nobler faculties of intellect and will, which are so intimately united to the specific nature of the beings that possess them, are necessarily accidental, as forming no part of the essence; *à fortiori* will such be the case in an inferior and generic faculty, such as the locomotive. Lastly: Though locomotion can boast of this pre-eminence over other accidents of a like nature, that it produces less of change in its Subject; yet, on the other hand, it is furthest removed from substance, because it is not absolutely ordered to it, and has the least possible likeness to, or agreement with it. Consequently, it is in the last degree improbable, that the substantial form should be determinable to the production of such an effect, without the intervention of an accidental instrument.

DIFFICULTY.

Entities are not to be unnecessarily multiplied. But the alleged two principiants—that is to say, the substantial form and the accidental faculty—are not both necessary to the operation of finite substances. Therefore, etc. The *Minor* is proved as follows: (i.) The substantial form, being of a nobler order, is capable of doing all that the faculty, supposed to be conjoined with it, is capable of doing. (ii.) If the faculties flow from the essence of a true causality; the essence must virtually contain the faculties in itself. Therefore, it can do itself, whatever its faculties do.

Answer. The *Major* is granted. It is axiomatic. The *Minor* is denied. A sufficient necessity is to be found, in the fitness of a finite substance having faculties appropriated to its accidental operations; since the proper function of its substantial form is the first act, or the specific actuation of the substantial composite, as has been often said before. Now, for the two proofs of the *Minor*: As to the first, the cryptical *Major*—viz. *An entity of a superior order is capable of doing all that an entity of an inferior order can do,*—is denied, if taken as a universal proposition. Thus, for instance, the

hand is of a superior order to the pen ; yet it cannot write without the aid of a pen, or of some similar instrument. The soul is a more perfect entity than the eye ; yet it cannot see without the eye. As to the second proof: Suarez says that the soul does not contain its faculties eminently, but only instrumentally, in itself. This difference may be aptly illustrated from mechanical art. A workman makes a saw. He is, accordingly, its Efficient Cause; and it is fashioned according to the exemplar cause, or pattern, in his mind. Yet, he does not contain it in himself eminently or virtually; so as to be able to do unaided all that it can do for him.

PROPOSITION CCLV.

The previous Theses evince, that substance can in a manner produce accidents, without any change in itself, by natural resultance; and that accidents, in consequence, can be the causes of accidents, without involving an infinite series. Accordingly, the problem proposed at the beginning of this Section is satisfied.

This Proposition is a plain corollary from all that has gone before ; and needs no declaration. The properties, including all the faculties of all finite substances, proceed from the essence by natural resultance, or necessary concomitance ; and these are the proximate causes of all operation, whether terminated to substantial generation or to accidental alterations.

§ 3.

WHAT ACCIDENTS ARE CAPABLE OF BEING IMMEDIATE PRINCIPIANTS ?

PROPOSITION CCLVI.

Of all the accidents Quality is the only one that is capable of being an Efficient Cause.

PROLEGOMENON I.

The question mooted in the present Section refers exclusively to real causality, not to production by resultance; for any accident may result from any accident that is capable of becoming its Subject. Thus, for instance, by simple division of a given quantity, there necessarily result two new forms or shapes; and these belong to the Category of Quality.

PROLEGOMENON II.

Though the inquiry here instituted embraces the causal action of accidents universally; nevertheless, from the very nature of the case, it becomes in reality limited to the causal action of accident in the production of accident. For accidents act on substances, only by acting on the accidents of these latter.

The Proposition virtually consists of two Members.

I. THE FIRST MEMBER,—in which it is asserted, that *no other of the accidents besides Quality is capable of becoming an Efficient Cause*,—is declared by a separate examination of each.

(i.) Quantity cannot be an Efficient Cause. For Quantity, as has been already shown, imitates the nature of matter, and is purely passive and receptive; consequently, it is entitatively incompetent to exercise any activity. Neither can it generate, even in its own Category; since, like matter, it is physically incapable of either increase or diminution. As property of the generic body-form, it was once for all concreated with the simple bodies. So much and no more it then was, now is, and ever will be to the end, within the limits of the physical order; like the primordial matter which it follows. Hence, like the latter, it is incapable of intrinsic change, and is obnoxious only to fresh distribution. (ii.) Neither can *Relation* become an Efficient Cause; first of all, because of its deficient entity. A Relation, as will be seen later on, adds nothing real to its foundation. Accordingly, no Relation can be said to be active, save by an extrinsic denomination derived from its foundation. But, if the entity that constitutes the foundation is active; it will be a quality. This is the teaching of the Angelic Doctor. 'The entity of relatives,' he writes, 'is almost entirely derived from their foundations[1];' and the reason why he introduces *almost* is, (as he explains himself in the preceding Chapter), because Relation also receives some sort of entity from the term. Again: It is absonous to suppose that a relative should be capable of producing an absolute entity, by reason of the diversity and inferiority of order. Lastly: One Relation is not capable of producing another Relation; because a Relation is no term of causal activity, but simply results from the position of the foundation and the term. Thus, for instance, paternity, or the relation of fatherhood, results from active generation as foundation,

[1] 'Et quia entitas relativorum quasi tota est a fundamentis,' etc. *Opusc.* xlviii (*aliter* xliv), *tr.* 5, *c.* 4.

and from the birth of the child who is the term. (iii.) Action cannot become an Efficient Cause; on the contrary, itself postulates an Efficient Cause, for the reason that it is the causality *in fieri*. It is a motion; and postulates an Efficient Cause and an effect for its two terms. Action is really the effect in the course of production, but including an extrinsic denomination derived from the agent. Hence, St. Thomas says that 'the nature of Action as a Category consists in this,—viz. that Action designates a form in motion or in course of change, as proceeding from an Efficient Cause[1].' Consequently, it is so far from being competent to play the part of an Efficient Cause, that it needs one on its own account, and is really identified with an effect in course of production. Neither is it cause of the term, but the road to it. (iv.) Efficient Causality cannot be attributed to *Passion*, or the reception of the effect—better, the effect as in course of being received—in the Subject; because it is not formally, but only fundamentally, distinct from Action. 'It is to be remarked,' says St. Thomas, 'that Action and Passion are one and the same thing; that is to say, a form which is in flux, or course of production[2].' But Action connotes the agent, Passion the Subject. To take an instance: A bar of iron is being heated in a furnace. The form of heat, which is passing into the iron, is in course of production there. If we consider this nascent form in its transcendental relation to the fire which is agent, it falls under the Category of Action; if as received in the bar of iron, under the Category of Passion; if absolutely in itself as a form, under the Category of Quality. As an Action, it is *heating;* as a Passion, *heated;* as a Quality, *heat*. Consequently, Action and Passion are distinguished from each other, only by an extrinsic, albeit real, denomination. This being so, Passion is as incapable of becoming an Efficient Cause as Action; nay more, by reason of its utter passivity. (v.) Neither can *Place* exercise the functions of an Efficient Cause. For, if we consider it, as it were, extrinsically,—that is to say, as the containing and contiguous superficies which externally limits the entity *placed*; it does not really differ from Quantity. If, on the other hand, it is considered as an intrinsic mode of

[1] 'Ratio actionis, prout est praedicamentum, consistit in hoc, quod actio dicit formam in motu vel mutatione ut est a causa efficiente.' *Ibid.*

[2] 'Notandum quod actio et passio sunt una res et eadem, scilicet forma quae est in fluxu vel fieri.' *Ibid. c.* 1, *De Passione.*

this entity, it is equally impotent; for a mere mode, of itself, confers no entity (properly so called) on that which it modifies. (vi.) A fortiori, *Time*, *Position*, *Personal Property*, as such, are incompetent to exercise causal action; as is abundantly clear.

II. The second member, wherein it is asserted that Quality is capable of being an Efficient Cause, is proved by the following arguments. (i.) By process of exhaustion. It has been shown in the *two hundred and forty-fifth* Proposition, that accident is the instrumental cause of the production of substances; and in the *two hundred and fifty-third* Proposition, that accident is likewise the cause of the production of accidents. Hence, there must be some accidents that are, in one way or other, causes of all natural effects. But it has been just demonstrated, that all the other Categories of accident are incompetent to assume the function of an Efficient Cause. Therefore, there only remains Quality. (ii.) There are certain characteristics of Quality, which markedly fit it for becoming an Efficient Cause. In the first place, with the exception of Quantity, it is the only accident that has a real entity of its own distinct from its Subject. All the rest are, in one way or another, relative. Then, in the second place, it partakes of the nature of form; just as Quantity partakes of the nature of matter. Since, then, form is the source of operation; Quality has a special consonancy with causal action. (iii.) The above arguments are confirmed by the facts of experience. It is universally recognized, that the action of bodily substances proceeds from faculties, powers, or forces, proper to each or common to many species. It is equally clear, that thoughts and volitions proceed from certain powers in the human soul. (iv.) The truth of this Member of the Proposition is further confirmed by the authority of the Angelic Doctor. 'A substantial form,' he writes, 'is not principiant of action, save through the medium of a faculty. In certain entities, indeed,' (that is to say, in spiritual substances), 'the form itself is the faculty; yet not in its character of form. But, in certain entities, the faculty is really distinct from the substantial form of the entity; as we see in all bodily entities, from which actions proceed, only through the medium of certain of its qualities[1].' It may be said

[1] 'In quibusdam quidem ipsa forma est virtus, sed non secundum rationem formae; in quibusdam autem virtus est aliud a forma substantiali rei; sicut videmus in omnibus corporalibus, a quibus non progrediuntur actiones nisi mediantibus aliquibus suis qualitatibus.' *Verit. Q.* ii, *a.* 14, *c*, *in med.*

parenthetically, that the above passage gives unusually strong support to the opinion maintained in this Work, that there is no physical distinction between the essential nature of the soul and its spiritual faculties. Again: 'In the actions of nature, the substantial forms are not the immediate principiant of action; but act through the medium of active and passive qualities, as their proper instruments[1].'

DIFFICULTIES.

I. The following objection is directed against the first Member of the Proposition. Some actions are principiants. Therefore, etc. The *Antecedent* is thus proved. Certain immanent actions produce habits. Thus, by repeated exercise of thought on a certain subject-matter, a scientific habit is formed; and, by repeated actions of the will, moral habits are formed. But habits are qualities. Therefore, etc.

ANSWER. The *Antecedent* is denied, together with the proof. The sophism is based on an unphilosophical confusion between the two terms, *action* and *act*, which in the Latin, English, and most modern, languages are often used indiscriminately. It is not the actions of thinking or of willing, that form the said habit; but the acts of thinking or willing, by which the actions are intrinsically terminated. Now, these acts are in the Category of Quality.

II. The second objection is likewise directed against the first Member of the Thesis. In the introduction to the preceding Section it was declared, that *the adequate effect and the formal principiant (or proximate Efficient Cause) must be in the same Category.* If so, each accident should by rights be produced by another like itself; so that quantity should produce quantity, action action, place place, and so on for the rest. Therefore, quality cannot be the only accident capable of becoming a principiant, or Efficient Cause.

ANSWER. All the accidents but quality are, in one way or other, produced by resultance. Quantity is property and, consequently, a result of the body-form. Moreover, it is not subject to production, as we have already seen; and its change of distribution is a resultance from the new generation of bodies.

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[1] 'In actionibus naturalibus formae substantiales non sunt immediatum actionis principium, sed agunt mediantibus qualitatibus activis et passivis, sicut propriis instrumentis.' 4 *d.* xii, *Q.* 1, *a.* 2, *q.* 2, *c.*

Relation is a result of the position of the foundation and term. The last six Categories are, as it were, modes which terminate an entity by an extrinsic denomination. 'A denomination is extrinsic,' writes the Angelic Doctor, 'when it is not from anything in the formal Subject of denomination, but there is an absolute extrinsic something from which such denomination arises. . . . And such extrinsic denominations express another reality, distinct from the Subject of denomination; which other Categories that denominate intrinsically do not possess, although the things themselves from which such denomination is derived, remain the same. Such diversity suffices to distinguish the Categories. And in such way these six Categories are distinguished from the four preceding; that is to say, by the extrinsic entities which the former denominate, while the latter include no such denomination[1].' These six Categories, then, are results, not terms of causal action.

PROPOSITION CCLVII.

Not all qualities are capable of becoming Efficient Causes, but only certain qualities under the first three genera.

Prolegomenon.

The four genera (some call them species), enumerated by the Philosopher in his Categories, are the following: (i.) Habit and Disposition; (ii.) Natural Power (or Faculty) and Impotence; (iii.) An Affection and Affective Quality; (iv.) Figure or Shape. The full explanation and discussion of these classes are reserved for another Book.

The Enunciation virtually comprises two Members.

I. The first member,—in which it is asserted that *qualities in the last genus* (*that is to say, Figure or Shape*) *are incapable of becoming Efficient Causes*,—is thus declared. Figure or Shape is a mere mode of Quantity. As, then, Quantity cannot exercise

[1] 'Secundo modo fit denominatio ab extrinseco, scilicet ab eo quod non est in denominato formali, sed est aliquid absolutum extrinsecum, a quo fit talis denominatio. . . . Et talia sic denominantia denominatione extrinseca important aliam realitatem quam rem denominatam; quam non important alia praedicamenta quae intrinsece denominant, licet ipsae res a quibus accipitur talis denominatio sint eaedem; et talis diversitas sufficit ad distinguendum praedicamenta. Et isto modo ista sex praedicamenta a primis quatuor distinguuntur, scilicet per res extrinsecas quas denominant, quod non faciunt illa quatuor.' *Opusc.* xlviii (*aliter* xliv), *tr.* 5, *c. unic., De sex Praedic.*

Efficient Causality; so neither can its mode. St. Thomas puts the same argument in a somewhat different way. 'Now, Shape,' he writes, 'is principiant neither of action nor of passion. Otherwise, mathematical bodies could be active and passive[1].' It would, in fact, be difficult to imagine what Efficient Causality could proceed from lines, circles, triangles, curves, etc.; unless we consider them as depicted, or otherwise visible to sight, and so producing impressions on the eye and on the sense of sight. But such consideration brings them under another genus of Quality.

II. THE SECOND MEMBER asserts, that *certain qualities under the first three genera are capable of becoming Efficient Causes.* This proposition is equivalent to two; viz. that there are qualities under each of these subaltern genera, which can exercise Efficient Causality, and that, in each of the same three, there are other qualities which cannot exercise such causality. Let us determine each under the respective divisions.

i. To take the genus of Disposition and Habit: It is perfectly plain, that intellectual and moral habits are capable of Efficient Causality; for this is the reason of their being. It is their nature to assist the faculties of intellect and will respectively, in eliciting their acts with greater ease. There are natural, or physical, habits on the contrary, which are incapable of such causality. Of such kind is, for instance, a healthy habit of body. Yet the same cannot be said of all physical habits; for the athletic habit is obviously active. Many Dispositions are likewise active; but by no means all. For acts which belong to this genus are included under Dispositions. Now, inasmuch as acts dispose the faculty towards a habit; in such respect, they are causal. Hence, between intellectual or moral habits and intellectual or moral acts there is a causal reciprocity; for habits produce acts, and acts produce habits. But there are many acts which do not generate habits, and are not Efficient Causes; as, for instance, all acts of sensile perception. To this statement, however, it may with some apparent reason be objected, that acts of sensile perception often do generate habits. Thus, the eye of an artist gets habituated by practice to the perception of delicate *nuances* of colour and form, which would pass unnoticed by an ordinary observer. In like manner, a wine-taster acquires an

[1] 'Figura autem nullius actionis principium est neque passionis; alias mathematica corpora essent activa et passiva.' *Cg. L*, iii, *c*° 105.

unusually delicate sense of the bouquet of wines; and it is well known, that a medical man acquires a peculiar sensitivity of touch in the thumb and fore-finger of his right hand. All these peculiarities are produced by repeated acts. Therefore, acts of sensile perception do produce habits. For answer: The conclusion overlaps the recorded phenomena. Without going into unnecessary particulars, it seems plain that such endowments are not habits in the strict sense of the term. That which the artist has gained, gives him a discriminating power in the appreciation of form, colour, light and shade, etc.; but it does not make him see better. He could see as well at the beginning, as he sees now; perhaps better. The fact is, that he has acquired (if anything) an intellectual or esthetic habit. So, the wine-taster has not acquired a greater facility in the act of taste, but in the discrimination of flavours. Further: It is certainly not a legitimate inference from facts, that such qualifications are the effect of repeated acts. There are in all probability very many, who have seen much more varied scenery than the artist, yet are comparatively impervious to the harmonious beauties of nature; and there are wine-bibbers, who have consumed more wine in a month than the *connoisseur* in a year, and would notwithstanding find great difficulty in distinguishing champagne from cider. Two things mainly contribute to these accomplishments. Very much is undoubtedly due to a natural disposition, endowed with great sensitivity; and the rest is due to a concentration of mind upon the particular class of objects, which reacts upon the corresponding nerves.

ii. Proceeding to the second genus of Power (or Faculty) and of Powerlessness, we may at once exclude the latter; since it merely denotes an incapacity, whether purely negative or privative, and a negation cannot act. Thus,—to borrow the example adduced by Aristotle[1],—illness is an incapacity of being, more or less, proof against accidents that affect the due disposition of the body. But sickness is not causal. When it is catching and, in a certain way, causal; it is a power. Of the natural powers some are active, some passive. Active powers,—such as those of attraction, repulsion, assimilation, growth, intellect, will,—as the name implies, are distinctly causal. But passive powers are not. St. Thomas adduces the faculties of sense as an instance[2]; since, in

[1] *Categ. c.* 8. [2] *Opusc.* xlviii (*aliter* xliv), *tr.* 4, *c.* 3.

themselves, they are only capable of receiving impressions from without. Aristotle adds *hard* and *soft*, as instances respectively of passive power and impotence. 'For a thing is called hard,' he observes, 'because it has the faculty of not being easily divided; while a thing is called soft, because it has an impotence in regard of the same[1],'—that is to say, it is powerless to resist division. There is one other instance, given both by Aristotle and St. Thomas, which it may be well to refer to; because there is a seeming difference between the two on the point. The Angelic Doctor[2], as his words imply, quotes *boxers* and *runners* as instances of a passive power; while Aristotle[3] names them as examples of an active power. Neither of them, of course, refers to the training and *science* of the men; because these would fall under the first genus of Quality, as St. Thomas insinuates in the same place. Referring, then, exclusively to their natural fitness for such athletic exercises, it is safe to say that such men afford an illustration of an active and, at the same time, of a passive power; and thus the difference is easily reconciled. They give and take. Power of endurance often stands them in better stead than even active power of punishing the rival.

iii. The third genus comprises Affection and Affective Quality. Now, Affection is twofold,—active and passive. A passive Affection is a quality received in an entity. Thus, *sweetness* and *bitterness*, *heat* and *cold*, *colour*, etc., are passive Affections; since they have been received in such or such bodily substance. These, *as such*, are incapable of causal action. But these same qualities may likewise, from another point of view, be regarded as active Affections,—that is to say, as affecting others. Thus, the afore-mentioned qualities, as capable of producing an impression on one or other of the senses, are active Affections. Similarly, *red*, as caused by shame, and *pallid*, as caused by fear, are passive Affections. *Anger*, *concupiscence*, *fear*, etc., as existing in the soul are

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[1] Τὸ μὲν γὰρ σκληρὸν λέγεται τῷ δύναμιν ἔχειν τοῦ μὴ ῥᾳδίως διαιρεῖσθαι, τὸ δὲ μαλακὸν τῷ ἀδυναμίαν ἔχειν τοῦ αὐτοῦ τούτου. *Cat. c.* 8.

[2] 'Si vero tale principium sit passivum, . . . tunc est principium transmutandi ab alio, in quantum est aliud: et ad hanc speciem qualitatis pertinet durum et molle, pugillator et cursor, et hujusmodi. Ita quod non sumitur pugillator ab arte pugillandi, quia sic esset in prima specie qualitatis, sed pro potentia naturali.' *Cg. L.* iii, *c*° 105.

[3] Οἷον πυκτικοὶ ἢ δρομικοὶ οὐ τῷ διακεῖσθαί πως λέγονται, ἀλλὰ τῷ δύναμιν ἔχειν φυσικὴν τοῦ ποιῆσαί τι ῥᾳδίως. *Cat. c.* 8.

passive; as producing changes in the body, they are active. The only difference between an Affection and an Affective Quality consists in this;—that the former is transitory, the latter enduring. From the above explanations it will be easily seen, when an Affection or Affective Quality is capable, or contrariwise incapable, of becoming an Efficient Cause.

DIFFICULTIES.

I. It would seem, if we are to judge from experience, that Shape does exercise causal action. Take the instances of a *knife* and of a *saw*. The knife cuts, because it is sharp;—that is to say, because it tapers down to a fine edge. So, a saw makes its way through the wood, because of its row of teeth. But the fine edge and the regular indentation are shapes. Therefore, etc.

ANSWER. In both the instances given, the shape of the instrument can only be regarded as a due disposition of the instrumental cause; but not as in any wise conducing to the effect by any causal action of its own. So it is with other similar instances. The sharp cut-water of a racing boat assists, it is true, the swiftness of the motion. But how? By minimizing the reaction of the water. It does not take any part in the actual movement of the boat.

II. But there are cases of common occurrence, in which one shape produces another like itself. Thus, moulds impress their own form on the substances that are moulded by them: Dies leave their impress on the coin: A seal stamps its image on the wax.

ANSWER. In all these and similar instances, the body that is agent in the operation produces, by its contact with the other body, a new arrangement of the quantity, or quantified matter, that corresponds with its own; whence arises a certain correspondence of shape. But the one shape is not Efficient Cause of the other. A sure proof of the truth of this assertion is found in the fact, that the shapes, though corresponding, are contrary. The elevations in the mould become depressions in the cast, and *vice versa*. They fit, but do not agree.

§ 4.

Do accidents cause accidents without the concurrence of the substantial form?

PROPOSITION CCLVIII.

Although it is maintained by Suarez, that in all vital actions the soul, as substantial form and principal agent, immediately concurs with its faculty towards the production of the act by its own direct causality; yet there are solid reasons for doubting, whether such is the opinion of the Angelic Doctor touching such vital actions as are not spiritual, but limited to some bodily organ as to their proximate and instrumental principiant.

Prolegomenon I.

In the Enunciation, the term *soul* is used in its widest signification, as inclusive of the substantial forms of vegetative and animal, as well as of human life. Such is its common signification in the peripatetic and Scholastic philosophy.

Prolegomenon II.

The problem here proposed may be thus stated: Does the soul in every vital action,—for instance, in that of growth, assimilation, sensile perception,—cause the act or effect by its own direct action as its faculty does, so that its action is immediately terminated to the effect? or is it principiant of the effect mediately,—that is to say, only as principiant of the faculty by moving and directing this latter to the production of the effect? By way of illustrating the difference between these two, let us put to ourselves a parallel question: Does the man only drive and direct the horse towards the place whither he wants the animal to go, or does he, together with the horse, himself impart the necessary motion? In the present Proposition a partial answer is given to the question; since it is concluded, on the authority of St. Thomas, that, in certain vital actions, the soul does not directly and immediately contribute to the production of the effect. Thereupon arises another question: Is there any kind of vital action, in which any soul directly and immediately conspires towards the act? To this an answer will be given in the next Proposition.

Since the present Thesis *ex professo* rests on the authority of

St. Thomas; the passages shall here be given, in a collected and ordinated form, which supply the premisses for the arguments that will be afterwards presented.

i. Speaking of the faculties of the human soul, St. Thomas says: 'A faculty may be an act of the body in one of two ways; first, forasmuch as it is a certain faculty of the body. So considered, it is said to be an act of the body, because it informs the bodily organ, in order to enable the latter to accomplish its proper act; as, for instance, the faculty of sight gives a perfection to the eye, so that it may accomplish the act of seeing. It is not in such wise, that the intellect is act of the body. Secondly,' a faculty may be said to be an act of the body, 'by reason of the essence in which it is founded; and in this sense the intellect, and the other faculties likewise, are united to the body, forasmuch as they are in the soul which, in virtue of its essence, is form of the body[1];'—that is to say, a faculty may be an act or form of the body in two ways: Either directly, because it informs some bodily organ; or indirectly, because it belongs to the soul which is substantial act of the body.

ii. 'All the faculties of the soul are related to the soul alone, as to their principiant. But there are certain faculties which are related to the soul alone, as to their Subject;—to wit, intellect and will. Faculties of this nature must necessarily remain in the soul, on the destruction of the body. On the other hand, there are certain faculties which are in the integral composite, as in a Subject;—viz. all the faculties of the sensitive and of the nutritive part. Now, on the destruction of its Subject, an accident cannot remain. Wherefore, upon the destruction of the composite,'—by the separation of the soul from the body,—'faculties of this kind do not remain actually; but remain virtually in the soul, as in their principiant and root. Accordingly, that which certain persons say is false, that faculties of this nature remain in the soul on the corruption of the body; and it is far more false, that (as they say) the acts

[1] 'Potentia potest esse actus corporis dupliciter. Uno modo, inquantum est potentia quaedam; et sic dicitur esse actus corporis, inquantum informat aliquod organum corporale ad actum proprium exequendum; sicut potentia visiva perficit oculum ad exequendum actum visionis: et sic intellectus non est actus corporis. Alio modo, ratione essentiae in qua fundatur; et sic tam intellectus quam aliae potentiae corpori conjunguntur ut forma, inquantum sunt in anima, quae per suam essentiam est corporis forma.' *Verit. Q.* xxvi, *a.* 9, 3^m.

likewise of these faculties remain in the separated soul, because such faculties cannot function save by the instrumentality of a bodily organ[1].'

iii. 'Not only the acting and possible intellect'—two *quasi* faculties which, according to the Scholastic philosophy, are necessary in the actual order to the process of thought—'meet together in the one essence of the human soul; but likewise all the other faculties, which are principiants of the operations of the soul. For all such faculties have their root, some way or other, in the soul. Some—to wit the faculties of the sensitive and vegetative parts—are in the soul as principiant, but in the composite as their Subject, because their operations are those of the composite, and not of the soul alone; *for whose is the action, its is the faculty.* But there are certain faculties which are in the soul as their principiant, and likewise as their Subject; seeing that their operations are those of the soul, independently of any bodily organ. Such are the faculties of the intellectual part[2].'

iv. 'Seeing, then, that there are, rooted in one and the same essence of the soul, faculties which are separate, (as has been observed), and faculties which are not separate from the body; for this reason, there is nothing to hinder certain faculties of the soul from ceasing to exist together with the body, while others remain incorruptible[3].'

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[1] 'Omnes potentiae animae comparantur ad animam solam sicut ad principium. Sed quaedam potentiae comparantur ad animam solam sicut ad subjectum, ut intellectus et voluntas; et hujusmodi potentiae necesse est quod maneant in anima, corpore destructo. Quaedam vero potentiae sunt in conjuncto sicut in subjecto, sicut omnes potentiae sensitivae partis et nutritivae. Destructo autem subjecto, non potest accidens remanere. Unde corrupto conjuncto, non manent hujusmodi potentiae actu, sed virtute tantum manent in anima sicut in principio vel radice. Et sic falsum est quod quidam dicunt, hujusmodi potentias in anima remanere, etiam corpore corrupto; et multo falsius quod dicunt, etiam actus harum potentiarum remanere in anima separata; quia talium potentiarum nulla est actio nisi per organum corporeum.' 1ª° lxxviii, 8, *o.*

[2] 'Non solum autem intellectus agens et possibilis in una essentia animae humanae conveniunt; sed etiam omnes aliae potentiae, quae sunt principia operationum animae. Omnes enim hujusmodi potentiae quodammodo in anima radicantur; quaedam quidem, sicut potentiae sensitivae et vegetativae partis, in anima sunt sicut in principio, in conjuncto autem sicut in subjecto, quia earum operationes conjuncti sunt, et non solum animae: cujus est enim actio, ejus est potentia: quaedam vero sunt in anima sicut in principio et in subjecto, quia earum operationes sunt animae absque organo corporali, et hujusmodi sunt potentiae intellectivae partis.' *Opusc. I*, c° 89.

[3] 'Sicut igitur in eadem essentia animae fundantur potentiae quae sunt separatae, ut dictum est, et non separatae; ita nihil prohibet quasdam potentiarum animae simul cum corpore deficere, quasdam autem incorruptibiles esse.' *Ibidem*, c° 92.

v. 'If there is any agent that *directly and immediately by its own action* produces substance, . . such an agent acts by its own essence; as we attribute to God, Who produces the substances of things by creation[1].' This declaration of the Angelic Doctor is made, in the course of a proof that the soul is not identical with its faculties.

vi. 'Since the essence of the soul is but one principiant, it cannot be the *immediate principiant of all its actions;* but it must of necessity have many and diverse faculties, to correspond with the diversity of its actions[2].'

vii. St. Thomas resolves the question, *Whether the human soul is identified with its faculties,* in the following words: 'We can speak of the soul in two ways: first, as being a certain substance. In this way, it is impossible that the soul should be identified with its faculties; for two reasons. One of these is derived from that which is proper to the soul, as thus: It is impossible that the same entity under the same aspect should naturally be the principiant of effects, many in number, and differing, nay all but opposite. Now, the soul, in accordance with the diversity of its faculties, is found to be the principiant of acts specifically different, and all but opposite. Hence, it is impossible that the very essence of the soul, which is one, should be the immediate principiant of these. Wherefore, it is necessary to suppose in the soul, over and above its essence, natural faculties which are the immediate principiants of these acts. The second reason is taken from that which is common to the soul, as to every created substance. For in no one created substance are existence and operation the same; seeing that this is the attribute of God alone. Now, essence is the principiant of being; but faculty, of operation. Consequently, as from one there is naturally one only; no substance, save the Divine, is its own faculty[3].'

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[1] 'Si vero est aliquod agens quod directe et immediate sua actione producat substantiam, sicut nos dicimus de Deo, qui creando producit rerum substantias, . . . hujusmodi agit per suam essentiam.' *Anima, a.* 12, *c. p. m.*

[2] 'Et ideo, cum essentia animae sit unum principium, non potest esse immediatum principium omnium suarum actionum; sed oportet quod habeat plures et diversas potentias correspondentes diversitati suarum actionum.' *Ibid. in fi.*

[3] 'De anima dupliciter loqui possumus. Uno modo secundum quod est quaedam substantia; et sic impossibile est quod anima sit suae potentiae, duplici ratione; quarum una sumitur ex eo quod est animae proprium; quia scilicet impossibile est ut idem secundum idem sit naturaliter principium plurium et diversorum numero, immo quasi oppositorum. Anima autem secundum diversas potentias invenitur esse principium actuum diversorum secundum species, et quasi oppositorum. Unde impossibile est quod ipsa essentia animae, quae est una, sit immediatum horum prin-

viii. The two concluding passages are taken from an Article in which St. Thomas is discussing the question: *Whether grace is in a faculty or in the soul.* He decides, that grace affects the essence of the soul, in a way that he afterwards explains. But against this conclusion he brings the following (which is his fourth) objection: Grace is opposed to sin. But all sin—at least actual—is in some faculty, as in a Subject. Therefore, since opposites are concerned with the same, it would seem that grace too is in a faculty, as in a Subject.' St. Thomas replies: 'Because every operation regards a determined faculty, which is its principiant; hence it is, that sin is in the faculty, antecedently to its being in the essence of the soul[1].'

ix. Against the same conclusion the Angelic Doctor brings his fifth objection, as follows: 'Habits infused,' by the operation of grace, 'and habits acquired do not differ, save in regard of the Efficient Cause. . . . . But acquired habits are in their faculty, prior to their being in the essence; for they are only in the essence through the medium of the faculty. Therefore, infused habits must be likewise. Consequently, grace is not in the essence of the soul as in a Subject, but rather in the faculty.' St. Thomas replies: 'Acquired habits are acquired by our actions; and so immediately appertain to the faculty[2].'

In the first four of the above quoted passages, the Angelic Doctor calls attention to a notable distinction between the various faculties of the human soul. He divides them into two great classes; the former of which he terms separated faculties,—that is to say,

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cipium. Et ideo oportet ponere in anima, praeter ejus substantiam, potentias naturales, quae sunt horum actuum immediata principia. Secunda ratio sumitur ex eo quod est commune animae et omni substantiae creatae. In nulla enim substantia creata est idem esse et operatio; hoc enim solius Dei est. Essentia autem est essendi principium, potentia vero operationis. Ergo cum ab uno naturaliter non sit nisi unum, nulla substantia, nisi Divina, est sua potentia.' *Quol.* x, *a.* 5, *c.*

[1] '(4) Praeterea gratia opponitur culpae. Sed omne vitium, ad minus actuale, est in aliqua potentia sicut in subjecto. Cum igitur opposita sint circa idem, videtur quod gratia etiam sit in potentia animae sicut in subjecto.' . . 'Quia omnis operatio respicit determinatam potentiam, inde est quod culpa per prius est in potentia quam in essentia animae.' 2 *d.* xxvi, *a.* 3, 4[m].

[2] '(5) Praeterea, habitus infusi et acquisiti non differunt nisi secundum principium efficiens: constat enim quod ad eosdem actus in specie ordinantur. Sed habitus acquisiti sunt per prius in potentia quam in essentia; non enim sunt in essentia nisi mediante potentia. Ergo et habitus infusi. Non igitur gratia est in essentia animae sicut in subjecto, sed magis in potentia.'

'Habitus acquisiti per actus nostros aggenerantur, et ita ad potentiam immediate pertinent.' *Ibidem*, 5[m].

independent of the body and, as faculties formally such, not acts of the body,—exclusively existing in the soul as in their proper and adequate Subject. These are the spiritual faculties of intellect and will. The other and lower class comprises those faculties which inhere in the integral composite of soul and body, or some specific organ of the body, as in their proper and necessary Subject. Such are all the faculties of the vegetative and purely animal life. Both equally depend upon the soul as their principiant,—that is to say, as the cause from which they flow and the essence in which they are rooted. But, even here, there is a most noteworthy difference. The lower faculties are *generic* properties. They belong to the human soul, as virtually supplying the place of lower and purely material forms. They belong to it exclusively as the act of the body; and, in consequence, they too are acts of the body and cannot function without it. They reveal their parentage from an inferior order. On the contrary, the faculties of intellect and will are *specific* properties of the human soul, and share in its spiritual nature. They are, as we have seen before, the absolutely necessary constituents of the soul in its integral integrity as a potential whole; and they belong to the body, only because they belong to the soul, being independent of the former in their natural operations. This difference between the two is of the greatest significancy; since it justifies the assertion of a real physical distinction between the soul and its lower faculties, while it equally justifies the conclusion—as has been stated already—that the distinction between the same soul and its upper faculties, though real, is metaphysical. Our present business is with the human soul and the lower class of faculties, including accordingly the vegetative and animal soul. The other question touching the upper faculties is reserved for the next Thesis.

Taking the teaching of St. Thomas for a basis, we prove the present Proposition by the following arguments.

I. The human soul in its essence is a spiritual substance, although incomplete as a substance. It is incomplete, because it is created to be the act of some body; and, consequently, when isolated from the body, it is despoiled of its substantial integrity. Hence, in this state it no longer possesses sensile or vegetative faculties, while retaining its own spiritual faculties of intellect and will. On the strength of this difference,—which has been fully developed in the second Prolegomenon,—it is thus argued. In order that the essence

of the soul may be capable of directly and immediately concurring, as principiant cause, towards the production of an effect proper to one of its lower faculties as proximate cause, it must be in itself absolutely competent for the production of such effect. Therefore, etc. The *Major* is thus declared. When two Efficient Causes concur with equal directness to the production of one and the same effect, each by itself must be capable of producing it; unless either one cause is dependent in its action on the other, or the causal action of each is necessary as complemental of the other, by reason of the separate incapacity of each. As to the former alternative: Though it is quite true, that the faculty is essentially dependent on the essence of the soul in its origin, existence, and power of action; yet it is not true, that it is *otherwise* distinctly dependent upon the soul for its acting and act *hic et nunc*. The reason is, that it is of the essential nature of a faculty, to have the intrinsic power of natural operation. A faculty is constituted for operation,—as St. Thomas remarks in one of the passages quoted,—just as the essential form is the principiant of the first act of being. The other alternative is equally inadmissible; for how could a faculty be incompetent to elicit its own act? On the other hand, there can be no *absolute* incompetence on the part of the soul to produce such acts; since it virtually and eminently contains within itself the vegetative and animal souls, to which these acts specifically belong. An objection may be brought against this proof, and in support of the first of the two alternatives. It may be urged that there are different kinds of dependence. There is an absolute dependence, and there is an (as it were) accidental dependence. In the former of these ways, the soul cannot possibly be dependent on its faculty; in the latter, it may, just as the artist needs his brush in order to paint the portrait. The objection is a good one, but does not affect the force of the argument. For what, after all, is the root of this dependence? It arises from a real physical incongruity between the act to be produced and the nature of the principal Efficient Cause. The mind of the artist cannot put colours on the canvas; because there is a disproportion between the cause and the effect. In like manner, the hand cannot paint; because there is a disproportion between the instrument and the effect. But, in these instances, the laying on of colour is the direct and immediate action of the brush; the hand supplies a directive motion to the brush; and the hand is directed by the mind of the artist. The brush is a true medium; and the

mind does not immediately concur as cause in the purely material act of laying on the colour. To pursue the illustration, because it is a useful and instructive one: It is quite another thing, when we come to the disposition of the colours. Both instruments together are quite incapable of the act, unaided; on the other hand, there is an evident and marked congruity between the act and the artistic habit of the intellect, which can alone design. Therefore, towards the production of this act it is not only fitting but necessary, that the principal agent should immediately concur. This leads us to the *Minor*,—viz. that *the essence of the human soul is not in itself competent for the production of the effects proper to the lower faculties*,—which is thus declared. In order that a cause may be capable of producing a certain effect; there must be some sort of proportion between the two. But there is no proportion between the spiritual nature of the soul and the said material effects. Therefore, etc. This argument is confirmed by the doctrine commonly received, that the soul, after its separation from the body, ceases even to possess the faculties. It is further confirmed by the teaching of the Angelic Doctor touching the action of demons on bodies. For he tells us, that these spiritual natures cannot by their own power alone transform bodies, because the cause is not proportioned to the effect; consequently, both good and evil spirits require certain physical agencies, by the instrumentality of which,—as being proportioned to the effect,—they are able to make material alterations[1]. By reason of the same defect of proportion, an Angel cannot sensilely see, or hear, or feel, or taste; even though he should assume some bodily form, provided with the organs of sense. But the essence of the human soul is likewise purely spiritual; consequently, as there is a similar defect of proportion between itself and material effects, it is, like these spiritual natures, incompetent to produce such effects, save through the medium of the faculties given to it for this purpose, and proportioned to the act. It may be said, that there is a great difference between the two; because Angels are complete substances and are pure spirits in the full meaning of the term, whereas the human soul is an incomplete substance and, (because it is substantial act of the body), is partly animal in its integral perfectness in the composite. This is true; but three things must be remembered. In its essence it is spiritual. As act of the body, it is formal cause

[1] *Ma. Q.* xvi, *a* 9, *c*, 1^m, 2^m. *Cf. Quol.* ix, *a.* 10, *c.*

of being; and, in consequence, supplies that vegetative and animal life to the body, which it contains eminently in itself. Thirdly: In order to do this, it provides, out of its own superior nature, the faculties which are connatural with these lower forms of life. But such faculties are not its properties by virtue of its own substantial nature, as it is in itself; though they are its properties as act, or form, of the body. Therefore, so far as regards the essence of the soul, the parallel holds good.

It will at once be seen, that this first argument applies to the human soul alone.

II. St. Thomas tells us, in the third quotation, that these lower faculties are not in the soul alone as their Subject, but in the integral composite. They are not even in the whole body as their partial subject, but are limited to some particular organs of the body. This fact seems to favour the position here maintained. For, if the soul immediately concurs towards the production of the act, it cannot need a faculty as instrument, because of defect of proportion; it can only, therefore, need the faculty, in order to determine it to such a specific act. When once, then, it has been so determined, it does not clearly appear why it should be limited in its action to some particular organ; since the soul is integrally present in every part of the body that it informs. Nor will it avail to say, that the soul is determined by the faculty which is in the organ and, therefore, mediately by the organ itself. For, first of all, the faculty is in the soul as well as in the organ. Secondly: This would explain the localization of the act, in the hypothesis that the faculty is the proximate cause acting in virtue of the soul; but it seems powerless to explain this localization, if the act proceeds directly from the essence of the soul. Again: Either the act of the essence and the act of the faculty are two distinct acts, or they are but one. If they are two distinct acts; there appears no reason why the act of the essence should be localized. If the act is one; then the causality will be twofold, either by combination of two partial causalities, (which has been already rejected as impossible in the particular case), or by unity of subordination. If the latter; it is difficult to conceive any other subordination of the faculty to the essence in the production of one effect, than that of an instrumental cause, immediately and directly producing the effect by a virtue derived from the principal agent.

III. A third argument is derived from the expressions habitually employed by the Angelic Doctor, whenever he has occasion to treat of this question. In the sixth quotation he says, that 'the essence of the soul cannot be the *immediate* principiant of its actions.' In the seventh quotation he asserts the same thing; and adds that 'the natural faculties are the *immediate* principiants of these acts.' Now, this term *immediate*, in the places cited, is capable of a double sense. It may possibly mean that the soul cannot determine itself to action, save through the intervention of the faculty, although, when so determined, it immediately concurs towards the effect; or it may mean that the soul does not exercise direct causality, but deputes the faculty (so to say) to produce the effect. In which of these two senses is the term used by St. Thomas? One might almost answer the question *à priori;* for the former interpretation uses the term in a non-natural sense. In fact, it would justify the contention, that there is no immediate action at all. For, if the action of the essence is only not immediate, because it is determined by the faculty; *à pari* the action of the faculty is not immediate, because it is initiated, directed, controlled by the essence. But we have more direct evidence in the sixth quotation, taken with the context. In the Article from which the quotation is borrowed, St. Thomas is discussing the question: *Whether the human soul is really identical with its faculties.* At the outset of his solution, he takes occasion to explain in clear and definite terms the meaning of those who answer the question in the affirmative. 'Those,' he writes, 'who maintain that the soul is identical with its faculties, mean by this, that the very essence of the soul is the immediate principiant of all the operations of the soul; and assert that man thinks, feels, and elicits other operations of this nature by the essence of the soul, and that the soul is called by different names in accordance with the difference of operations.' He goes on to say, that this opinion cannot stand, for two reasons. The first is, that an agent acts, forasmuch as it is itself actually that which it effects. Accordingly, the formal principiant is discernible by the effect. If, then, the effect is accidental; the formal principiant will be likewise accidental. This, he tells us, is manifestly seen in natural generation; for, since the substantial generation is the term of alteration, the principiant by which the alteration is made is an accidental form. Then he continues in these words: 'For this reason, no other principiants of action are seen in the

elements, save active and passive qualities which, however, act in the virtue of the substantial form; and on this account their action is terminated, not only to accidental dispositions but to substantial forms[1].' Then follows the passage quoted in the *Prolegomenon*.

Now, the relevancy of the above exposition to the matter in hand depends, in no slight degree, on the meaning to be attached to the words, *directly* and *immediately*. But their meaning can be surely ascertained by reference to the context. Wherefore: (i.) Throughout, St. Thomas never designates the soul, or the substantial form in general, a principiant of operations; on the contrary, as he states expressly, it is impossible that the formal principiant, when the effect is an accident, should be anything that forms part of the essence. (ii.) He states, that the only formal principiants of operation in the simple bodies are their active and passive qualities. (iii.) He maintains, that it is the accidental form—in the instance of the human soul, a faculty—which acts; but that it acts, when contributing to produce a substantial effect, in virtue of the substantial form. (iv.) When causing an accidental effect corresponding with its own nature, it would seem that it acts in its own virtue, not in the virtue of the substantial form, though always rooted there. (v.) He reminds us, that a

[1] 'Ponentes igitur quod anima sit suae potentiae, hoc intelligunt, quod ipsa essentia animae sit principium immediatum omnium operationum animae; dicentes quod homo per essentiam animae intelligit, sentit, et alia hujusmodi operatur, et secundum diversitatem operationum diversis nominibus nominatur; sensus quidem, inquantum est principium sentiendi, intellectus autem, inquantum est intelligendi principium, et sic de aliis; utpote si ignis calorem nominaremus potentiam liquefactivam, calefactivam et desiccativam, quia haec omnia operatur. Sed haec opinio stare non potest. Primo quidem, quia unumquodque agit secundum quod actu est, illud scilicet quod agit; ignis enim calefacit non inquantum est actu lucidum, sed inquantum est actu calidum; et exinde est quod omne agens agit sibi simile. Unde oportet quod ex eo quod agitur, consideretur principium quo agitur; oportet enim utrumque esse conforme. Unde in 2 Physic. dicitur, quod forma et generans sunt idem specie. Cum ergo id quod agit non pertinet ad esse substantiale rei, impossibile est quod principium quo agit sit aliquid de essentia rei; et hoc manifeste apparet in agentibus naturalibus. Quia enim agens naturale in generatione agit, transmutando materiam ad formam, quod quidem fit secundum quod materia primo disponitur ad formam, et tandem consequitur formam, secundum quod generatio est terminus alterationis; necesse est quod ex parte agentis id quod immediate agit sit forma accidentalis correspondens dispositioni materiae; sed oportet ut forma accidentalis agat in virtute formae substantialis, quasi instrumentum ejus; alias non induceret agendo formam substantialem. Et propter hoc in elementis non apparent aliqua principia actionum, nisi qualitates activae et passivae, quae tamen agunt in virtute formarum substantialium; et propter hoc earum actio non solum terminatur ad dispositiones accidentales sed etiam ad formas substantiales.' *Anima*, *a.* 12, *c.*

faculty is the sole formal principiant of operation; without making any exception in favour of the substantial form. (vi.) Finally: His whole argument may be reduced to this summary. The nature of the formal principiant must be determined by the nature of the operation or effect. But all the operations of the human soul are accidents. Therefore, their formal principiant must be an accident. Neither let it be said, that reproductive operations are terminated to substance; for they are formally terminated to certain alterations which, through the virtue communicated by the substantial form, result in a substantial transformation. Taking together the several points here enumerated, it can hardly be doubted that by the terms, *directly* and *immediately*, St. Thomas intended to exclude actual concurrence with its faculty in the production of the effect.

IV. The above inference is confirmed by the second argument, offered by the Angelic Doctor in the same place, (to be seen in the sixth quotation), and repeated in the seventh quotation. The argument is as follows: In the order of finite being, that which is essentially one cannot be, at one and the same time, the immediate principiant of a variety of actions specifically distinct. But the human soul is a principiant essentially one. Therefore, etc. Hence St. Thomas concludes, that the faculties of the soul are really distinct from its essence. Now, in the hypothesis that the essence of the soul immediately concurred with its faculties in the production of its operations, the above difficulty would remain unsolved; for, in such case,—by whatever process (which is a point indifferent),—it remains that the essence of the soul would be directly terminated, at one and the same time, to a number of operations specifically distinct. It may be said, that the determination by the several faculties does solve the difficulty; and that, consequently, the process is not a matter of indifference. But the assertion is denied. For the determination does not lessen the difficulty of a multiform simultaneous operation, more particularly in the instance of purely material forms; and, in the instance of the human soul, there remains the essential disproportion between the essence and the operation of the lower faculties, which the said determination has no power to reduce.

V. Another argument, contained in the seventh quotation, supplies us with an additional convincing proof of the truth of

the present Proposition. St. Thomas argues, that there must be a real distinction between the soul and its faculties; because the former is the principiant of the first act of being, while the latter are principiants of the second act of operation. But, as he urges, in no finite unity are being and operation identical. Therefore, the principiants of each must be really distinguished. This argument would be worthless, if the essence of the soul immediately concurred with its lower faculties (where the real distinction is physical) in such operations; for it would be direct formal principiant both of being and operation.

VI. The truth of the Proposition is further confirmed by the doctrine of St. Thomas in the eighth and ninth quotations. He there explains, why sinful acts as well as sinful habits are in the faculty of the soul only, as in their immediate Subject, and in the essence of the soul, exclusively through the medium of the faculty; and that it is in the latter, prior in order of nature to its being in the essence. The reason he gives is, that acts are proper to the faculty; and that habits are acquired by a repetition of acts. Consequently, both acts and habits belong formally to the faculty; and only belong to the soul, as being principiant of its faculties. But such an argument would obviously be no argument at all; if the essence of the soul should be directly terminated to the acts of its faculties.

VII. The last proof is taken from the logic of facts. For, in vegetative and animal reproduction, the facultative accidents do, as a fact, operate without the direct concurrence of the soul; since, as we have seen, there is ordinarily a physical separation between the two, and often the vegetative or animal soul is no longer in existence. So, the qualities of flowers, leaves, etc., energize, long after the separation of these parts from the substantial form of the plant.

DIFFICULTIES.

I. The first difficulty is directed against the first argument, and is taken from the act of writing. The act of writing, in itself, includes two things,—viz. motion of the hand and pen; and the impression thereby of the ink on the paper, which is clearly accidental to the latter. Here, then, if anywhere, there is discoverable the plainest disproportion between the operation

or effect and the essential nature of the soul. Yet it seems certain, that the intellect (a purely spiritual faculty and, as a consequence, obnoxious to precisely the same disproportion) immediately concurs with the faculty of locomotion towards the production of the writing; because that which is set down on paper is a photograph of thought. If, then, the intellect can concur, why not the essence of the soul? There is the same want of proportion.

Answer. It is categorically denied, that the intellectual faculty immediately concurs with the operation of writing. There is nothing to lead us to conclude, that it does more than direct the lower locomotive faculty by which the pen is set in motion. No one would be inclined to maintain, that the intellect of the London telegraphist had travelled with the telegram on its way to New York; yet it matters nothing to the present question, whether one writes with a wire and electricity, or with a pen and ink.

II. The second objection is directed against the second argument. As it is there urged, St. Thomas maintains that the lower faculties of the soul are in the composite, as in their Subject. But if they are in the composite; they are equally in the soul as in the body. It follows, that the soul is principiant of the operation no less than, and after the same manner as, the faculty and its organ. But these latter concur immediately and directly towards the production of the effect. Therefore, the essence of the soul does the same.

Answer. It is true that, since the faculty is in the integral composite as in a Subject, the soul is partial Subject of the faculty; yet not *as* the soul in its own essence, but as act of the body. Wherefore, considered exclusively as it is in its own spiritual nature, the lower faculties might almost be said to be accidents, in the specific sense of the word; though, considered in relation to the essence *adequately* such as inclusive of a substantial incompleteness, they are doubtless true properties. The reason is, that the soul, because of its incompleteness, essentially postulates substantial union with the body as necessary term of its perfection; and, therefore, in virtue of this act by which the body is informed with life, postulates all those faculties by which this life may be proximately capable of its second act of natural operation. Yet, for all this, such faculties are not in the *essence* of the soul, as in their partial Subject. St. Thomas is

express upon this point. The soul, then, in the case of these vegetative and purely animal operations, is not strictly speaking a formal principiant by direct concurrence; although it is a principiant of these actions, in a certain sense which will be explained in the next difficulty.

III. The third and last difficulty is directed against the third argument, which is derived from certain modes of expression habitually adopted by the Angelic Doctor. It is this. Though, in the passages quoted as in others, St. Thomas does not call the soul the formal principiant of its operations, but on the contrary expressly denies that it is, or can be such; nevertheless, in seeming contradiction with himself, he sometimes asserts in other places that the soul, as such, is principiant of its operations.

ANSWER. It has never been maintained, in this or any other Proposition, that the essence of the soul is in no sense whatsoever a principiant; but only that it is not the proximate and immediate, or direct, principiant in the sense already explained. Let the Angelic Doctor speak for himself, in one of the few passages that have been objected. 'This very fact,' he writes, 'that the accidental form is the principiant of action, it owes to the substantial form. Wherefore, the substantial form is the primary, but not the proximate, principiant of action.' The soul is the primary principiant, for two reasons: First, because the faculty is rooted in the soul from which it springs; secondly, because the faculty acts as immediate principiant in virtue of the substantial form.

PROPOSITION CCLIX.

It legitimately follows from the teaching of the Angelic Doctor, that, metaphysically considered, the soul is not a direct and immediate principiant of the operations of even the superior faculties of intellect and will; yet, that, if the question is regarded from a purely physical point of view, the essence of the soul is immediate principiant of these operations, by reason of the physical indistinction between the essence of the soul and these faculties.

I. THE FIRST MEMBER of this Proposition,—in which it is affirmed that, *according to the doctrine of St. Thomas, metaphysically speaking the essence of the soul is not a direct and immediate principiant of the*

operations of even the superior faculties of intellect and will,—is thus declared. Not only does St. Thomas not exclude these superior faculties from his general teaching on this matter, or make any exception in their favour; but, on the contrary, we find them expressly included in some of the passages that are collected in the second Prolegomenon to the previous Thesis. Again: Most of the arguments equally apply to all the faculties of the soul. For instance: That the substantial form is accountable for the first act and the faculties for the second, includes upper and lower faculties alike. Lastly: The eighth and ninth quotations are exclusively concerned with the operations of the will.

II. The second member,—in which it is stated that, *according to the same teaching, if the question is regarded from a purely physical point of view, the essence is immediate principiant of the operations of intellect and will, by reason of the physical indistinction between the essence of the soul and these faculties,*—is thus declared. If the distinction between the upper and lower faculties of the human soul, evolved in the second Prolegomenon to the preceding Proposition, be true; the doctrine here enunciated follows as a necessary consequence. Since, speaking physically, the faculties of intellect and will in act are the soul in its second act of natural operation; the soul itself thinks and wills *in*, and not only *by means of*, its faculties of thought and volition. The soul and these its specific qualities are existentially inseparable, according to St. Thomas, even in thought; it cannot therefore be conceived, that they should be separable in operation. The difference in this respect between the two classes of faculties is recognized in the common judgment of mankind. No one would be surprised at the expression: *My soul is in thought;* not so, if a man should say: *My soul has been taking a walk.*

PROPOSITION CCLX.

In the case of actions that are not vital, there is no sufficient reason for concluding, that an immediate concurrence of the substantial form with its accident is required.

This Thesis is proved by a twofold argument:

I. By induction from experience. Let us take the instance of heat in water or in a bar of iron. The accident is produced in both these substances by the action of an external agent; it is not con-

natural with either. Yet, in the one case as in the other, the accidental heat is capable of acting upon an external body, and of generating in this body an accident of the same nature with itself. Take again the instance of a green leaf, or of a flower in a *hortus siccus*. It often happens that the colour is preserved; while the substantial form, to which it primitively belonged, has perished long ago. A similar instance occurs in the medicinal properties of plants, to which attention has been drawn in a previous Proposition. In like manner, the colours and (so to say) patterns on the skins of animals and on the feathers of certain birds remain unimpaired, for years after the animal has ceased to exist. It is plain, therefore, that the substantial form in these cases does not immediately concur with the action of these accidents on our senses; for it does not exist.

II. By an *à priori* argument. There is no necessity for an immediate concurrence of the substantial form. Therefore, there is no such concurrence. The *Antecedent* is thus proved. There is no necessity on the part of the proximate cause, or on the part of the effect. Therefore, etc. There is no necessity on the part of the proximate cause; because the accident is a form and, as being a qualitative form of a certain species, is active. There is no necessity on the part of the effect which, as being itself accidental, is proportioned to, and consequently not beyond the capacity of, the accidental form.

ARTICLE IV.

The conditions of Efficient Causality.

As any one who considers the matter with sufficient attention will readily see, the conditions that form the subject of the present Article have nothing to do with the relation between the Efficient Cause and its effect. Had such been the case, they would not have been conditions, but consequents, of Efficient Causality; since this latter, as such, is simply terminated to the production of its effect.

What, then, is the precise relation which is affected by these conditions? The reader will bear in mind, that we are for the present exclusively occupied with the problems arising out of the nature of *finite* agency. Hence, it is not a question of creative, but of productive causality. Now, the main difference between the two consists in this; that the latter essentially postulates a Subject

out of which the effect is evolved, or at least in which it may be produced; while the former as essentially excludes any such Subject. The conditions, then, that form the material of the ensuing discussions, are those which affect the relations between the Efficient Cause and the Subject of its causality. These conditions are reducible to three; to each of which a separate Section will be devoted. The first comprises the nature of the distinction necessary between the two; the second, their necessary propinquity; the last, their mutual dissimilarity and necessary proportion.

§ I.

MUST THE EFFICIENT CAUSE BE REALLY DISTINCT FROM ITS SUBJECT, AS A NECESSARY CONDITION OF ITS CAUSAL ACTION?

Certain general Prolegomena.

PROLEGOMENON I.

In order to avoid any needless widening of the discussion, let this be premised. It is not necessary to finite causal efficiency, that the *supposit* or *person* of the agent should be really distinct from that of the Subject. As a fact, in all immanent action it is impossible that it should be so. A thought or volition, for instance, is an effect produced in the mind or will of him who thinks or wills. Generally speaking, in all vital action the supposit of agent and Subject is one and the same. The same substance that draws nourishment is nourished,—that causes growth grows,—that moves its limbs is moved.

PROLEGOMENON II.

In spontaneous motion the formal agent (*principium quo*) may be really distinguished from the formal Subject in various ways: (i.) According to a diversity of integrating parts. Thus, a man's legs are the proximate cause of locomotion to the rest of the body. (ii.) According to a diversity of substantial parts. Thus, the instinct in the soul of the sheep causes it to flee away from the wolf. Sleep suspends free-will. (iii.) According to a diversity of faculties. Thus, the intellect acts on the will; and the will acts on the intellect.

PROLEGOMENON III.

The causal actions that enter into the present inquiry are of different kinds. They may be (i.) a natural resultance, such as

intercedes between a substance and its property; (ii.) physical, material, transient actions, which are either generation specifically so called, alteration, growth, or locomotion; (iii.) immanent actions. Under the second head, *generation* may be at once eliminated; since it is incontestable, that in it there must be a real distinction, even of supposit, between agent and Subject.

PROPOSITION CCLXI.

In natural resultance, although it may happen that the proximate so-called Efficient Cause is not really distinct from the Subject; nevertheless, absolutely the effect is reducible to an Efficient Cause really distinct from the Subject.

It will be seen that this Proposition comprises two Members.

I. The first member,—in which it is asserted that, *in natural resultance, it may happen that the proximate so-called Efficient Cause* (that of which it is formally the result) *is not really distinct from the Subject*,—is equivalent to two propositions; viz. that the said cause is sometimes distinct, and that sometimes it is not distinct, from the Subject. As these are both particular judgments and, from the nature of their contraposition, can neither of them be subalterns to a universal; they are evidently capable only of inductive proof. Such shall be given of each.

i. *In natural resultance, the proximate so-called Efficient Cause is sometimes not really distinct from the Subject.* The truth of this statement is verified in the instance of the spiritual faculties of the human soul; for the two faculties of intellect and will flow from the soul as their proximate cause, and are received in the soul as in their adequate Subject.

ii. *In natural resultance, the proximate so-called Efficient Cause is sometimes really distinct from the Subject.* This is verified in the lower faculties of the human soul, as generally in all the faculties of animal and vegetative life. For such faculties proceed from the substantial form, yet are in the integral composite as in their adequate Subject. After a manner not altogether dissimilar, the shape of a body is in the quantity as in its immediate Subject; yet it often results from the action of some external cause, as in the squeezing of a caoutchouc manikin or in the slicings of a loaf of bread.

Note. Previous discussion on the nature of resultance will have

already rendered the reason for prefixing *so-called* to the proximate Efficient Cause sufficiently intelligible.

II. The second member,—wherein it is affirmed, that *absolutely such effect is reducible to the action of an Efficient Cause which is really distinct from the Subject*,—is thus declared. A property flows from the essence or substantial form, as its natural result. That agent, therefore, which is Efficient Cause of the existence of the essential nature, is *ipso facto* Efficient Cause of the property resulting from this essence. But the Efficient Cause of the essential nature is the generator, as is clear. Therefore, the generator is likewise Efficient Cause of the property. But the generator is really distinct from the Subject of passive generation and, consequently, from the Subject of the resulting property.

DIFFICULTY.

The generator is cause of the property, only remotely and by accident. But the present inquiry has to do with the absolute and proximate Efficient Cause. Otherwise, we might justly affirm that everything caused is caused by another really distinct from itself, even in supposit.

Answer. The reduction in question is not to a cause by accident, but to an absolute and (it may be said) only true Efficient Cause. Indeed, if the doctrine touching resultance, maintained in the second Section of the previous Article, is once admitted; the only Efficient Cause of a property, in strictness of speech, would be that of the essential nature from which the property flows. That which is absolute cause of an effect must be likewise cause of anything that necessarily results from this effect. Metaphysically speaking, the substantial form is the proximate Efficient Cause of the property, by reason of the essential dependence of the latter on the former; but even so, the reduction objected to holds.

PROPOSITION CCLXII.

Every Efficient Cause that operates by physical motion and transient action is really distinguished in some way or other from the Subject that receives the effect.

The Proposition is thus proved:

All physical motion and transient action in bodies may be reduced under three categories,—viz. alterations (or accidental transformation), growth, and locomotion. But the Efficient Cause,

in all accidental transformation, growth, and locomotion, is distinguished in one way or another from the Subject, or material cause, that receives the effect. Therefore, etc. The *Major* may be treated as certain; till some physical motion and transient action can be adduced, which is reducible to no one of these three divisions. It may be well here parenthetically to explain, why *growth* has a place to itself, distinct from other accidental transformations. The reason is, that growth is not a mere accidental transformation; since, though accidental to the nature or supposit of which it is predicated, it connotes a substantial transformation. The *Minor* comprises three Members, which shall be treated separately.

i. *In every alteration, or accidental change, the Efficient Cause is really distinguished from the Subject that receives the effect.* This assertion is supported by induction. No instance is known, or can be adduced, of a body, taken absolutely, causing in itself an accidental transformation. By the phrase, *taken absolutely*, is to be understood the body as an integral whole; for it is quite certain that one part of a body may produce alterations in another part. Thus, as we know from the conductibility of metals, the heat in one part of an iron bar will communicate heat to the part contiguous. In like manner, a man may strike his foot with his hand, and cause a redness there. But, so far as the present inquiry is concerned, the two parts or two members are practically two bodies. What is maintained here is this; that no body or part of a body, *as* that body and *as* that part of a body—excluding, of course, the substantial form which is a distinct entity—can of itself produce any accidental transformation in itself. All the known phenomena of nature conspire to assure us of this truth. The above argument from induction is confirmed by another that is more or less *à priori*. Every quality in bodies is either natural, forced, or indifferent, relatively to its Subject;—in other words, the Subject has either a natural disposition for the qualitative form, or a natural repugnance to it, or is indifferent, (that is to say, has neither a natural disposition for it nor a natural repugnance to it). If it has a natural disposition for the form, the case is covered by the preceding Proposition; for the quality will follow by natural resultance. If it has a natural repugnance; the quality must be forced upon it by the action of an external cause. If it is indifferent, again must the form be produced by an external agent; because, if it were produced either immediately or mediately by the

Subject, this latter would not be indifferent to it. Yet another confirmation of the truth of this member of the *Minor:* The same entity cannot be at once in potentiality and in act, relatively to the same. But, if a body could produce a quality in itself of itself, it would be in potentiality to this quality, as is plain; and, at the same time, in act relatively to the same quality, because otherwise it could not cause it.

ii. *In all instances of growth, the Efficient Cause is really distinguished from the Subject that receives the effect.* This proposition is a corollary from the preceding; for growth is a special kind of alteration. If we look at it by the light of modern physics; its truth receives fresh confirmation. There are three principal functions of a plant, which collectively contribute to its growth,—those of absorption, of assimilation, and of metastasis (or chemical metamorphosis). By these processes food-material is assumed from without; and is gradually transformed into the substance of the plant. Accordingly, the proximate Efficient Causes of growth are the faculties of absorption, assimilation, and of metastasis, operating in and by their proper organs. The principal organ of the absorptive faculty is the root; of that of assimilation, those parts of the plant that contain chlorophyl-cells, especially the leaves; of that of metastasis, the organs generally. 'Growth,' writes Professor Sachs, 'is only possible as a result of assimilation; but the two processes do not usually concur either in time or locality. The assimilated substances may remain in the plant for a longer or shorter time, without becoming employed in the growth of cell-walls or in the production of protoplasmic substances (protoplasm or grains of chlorophyl); and in this case they are termed *Reserve-materials.* Every cell, tissue, or organ, in which assimilated substances are stored up for subsequent use, is called a *Reservoir of Reserve-material.* The assimilating cell may itself serve as a reservoir for reserve-material, (as unicellular algae, or the leaves of evergreen plants). But usually a physiological division of labour is effected in the plant, of such a nature as to transfer the products of assimilation from the organs that contain chlorophyll to other organs or masses of tissue, which serve as reservoirs of the reserve-material, and give it up to the parts destined for the formation of new organs, (buds, the rudiments of the roots, or cambium[1],'—part

[1] *Text-Book of Botany, B.* iii, *ch.* 2, § 5, (*E. T., p.* 627).

of the tissue in the older parts of the plant. So then, to the growth of plants, (besides the material absorbed from without, which may be said in a way to be an Efficient Cause of growth, though more properly the material cause), there conspires the action of three Efficient Causes,—the three afore-mentioned faculties, which are distinct from the growing body and are properties of the plant-form. Even in the organs themselves there is ordinarily, as Professor Sachs has shown, a physical distinction. That which occurs in the growth of plants is more markedly observable in that of animals; for the reason that the process is much more complex.

iii. *In the locomotion of bodies, the Efficient Cause is really distinguished from the Subject that receives the effect.* St. Thomas shall help towards a complete exposition of this last proposition. 'Spiritual natures,' he writes, 'have of themselves a nature capable of imparting, but not of receiving motion. Bodies, on the other hand, are recipients of motion indeed; and, although one can move the other, nevertheless, no one of them can move itself. For such things as move themselves (as is proved in the eighth Book of the *Physics*) are divided into two parts, of which the one imparts motion and the other is moved. But in purely bodily entities this cannot be, because their forms cannot impart motion; although they can be principiants of motion, in the sense of being that in virtue of which motion is communicated. Thus, in the motion of the earth gravity is the principiant, in virtue of which motion is communicated; but it is not that which causes motion. This arises from the incompositeness of inanimate bodies, which have not such a diversity of parts as that one can impart motion and another receive the same; as well as from the ignobleness and materiality of the forms which, because they are widely distant from separated forms whose it is to impart motion, do not possess the power of causing motion, but only of being principiants of motion' in the sense explained above. 'On the other hand, living things are made up of an immaterial and of a bodily nature. Hence, in their case there can be one part that causes motion and another part that receives the same, in the instance of locomotion as of other motions. Wherefore, forasmuch as the receipt of motion is the result of the proper action of the animals themselves, in that they move themselves to determinate species of motion; there are perceived to be in animals special ordinate faculties. Thus, for instance, for locomotion there is in animals a locomotive faculty; in plants and

animals alike, a faculty of growth for the motion of growth; a nutritive faculty for the motion of alteration; a generative faculty for the motion of generation[1].'

It will be well to consider in its entirety the teaching of the Angelic Doctor here given us, even at the expense of being carried back in part to the previous members of the *Minor*. Let the following serve as a summary:

1. There are three, and only three, classes of substances,—to wit, separated forms (or purely spiritual substances); living bodies, which are constituted of an immaterial form and an organized body; inanimate bodies, which are composed of a material form and a body.

2. The first, or spiritual natures purely such, are capable of causing motion in others, but not of receiving motion. The reason is, that spiritual forms are acts; while a passive receptivity of motion connotes matter. The second, or living bodies, are capable both of imparting and receiving motion,—the one by virtue of their immaterial form, the other by virtue of their material body. The third, or inanimate bodies, are capable of receiving, but not of imparting motion.

3. Living bodies are capable of self-motion for three reasons: Because their forms are immaterial on the one hand, and they are bodies on the other; so that they are capable of both an active and a passive potentiality, as aforesaid. Secondly: Because they

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[1] 'Res enim spirituales absolute habent naturam ut moveant, sed non ut moveantur: corpora autem moventur quidem; et quamvis unum possit alterum movere, non tamen aliquod eorum potest movere seipsum; quia illa quae movent seipsa, ut probatur in 8 Physic., dividuntur in duas partes, quarum una est movens, et alia est mota.

'Quod quidem in rebus pure corporalibus esse non potest; quia formae earum non possunt esse moventes, quamvis possint esse motus principium, ut quo aliquid movetur; sicut in motu terrae gravitas est principium quo movetur, non tamen est motor. Et hoc contingit tum propter simplicitatem corporum inanimatorum, quae non habent tantam diversitatem in partibus, ut una possit esse movens, et alia mota; tum propter ignobilitatem et materialitatem formarum. Quae quia longe distant a formis separatis, quarum est movere; non retinent ut movere possint, sed solum ut sint motus principia. Res vero animatae sunt compositae ex natura spirituali et corporali; unde potest esse in eis una pars movens et alia mota, tam secundum motum localem quam secundum alios motus. Et ideo, inquantum moveri efficitur hoc modo propria actio ipsorum animatorum, ut ipsa seipsa moveant ad determinatas species motus; inveniuntur in animalibus speciales potentiae ordinatae; sicut ad motum localem in animalibus vis motiva, in plantis vero et in animalibus communiter vis augmentativa ad motum augmenti, nutritiva ad motum alternationis, generativa ad motum generationis.' *Verit. Q.* xxii, *a.* 3, *c.*

are organized; so that part is capable of moving part, member of moving member. Thirdly: Because they possess an ordered series of faculties; and are, in consequence, capable of causing in themselves determinate species of motion corresponding with these faculties.

4. Inanimate bodies are incapable of self-motion for two reasons. First of all, since their forms are purely material, of the lowest grade, and furthest removed from those separate existing forms that are purely active; they are incapable of initiating motion. Secondly: Because their bodies are not organized, but are of so simple a nature, that their potential parts are precisely similar to each other and to the whole body; and therefore there is not that distinction of parts, which would admit of one exercising causality of motion on another. Moreover, as being potential parts, there can be no motion but that of the entire body; and the movement of the whole body is *ipso facto* the movement of every potential part.

5. Nevertheless, inanimate bodies are principiants of their motion in a certain sense; forasmuch as they are endowed with properties, by virtue of which they are proximately capable of receiving motion. Thus, says the Angelic Doctor, the gravitation of the earth is in this sense principiant of the motion it receives. It is, so to speak, the reason of its motion. But the earth is not cause to itself of its own motion, which is imposed upon it by an extrinsic cause.

6. It follows from the above points of doctrine, that self-movement and life are inseparably linked together; so that, where there is life, there is self-movement; and where there is self-movement, there is life. As St. Thomas says: 'We say that an animal lives, when it begins to have self-movement; and an animal is considered to live, as long as such movement appears in it. But when it no longer has self-movement, but is only moved by something else; then the animal is said to be dead through the loss of life [1].'

With these points of teaching for our premisses, it will be easy to prove this member of the *Minor*. For no inanimate bodies can be causes to themselves of their locomotion, or movement from place to place. Therefore, in their case at all events the Efficient

[1] 'Primo autem dicimus animal vivere quando incipit ex se motum habere; et tamdiu judicatur animal vivere, quamdiu talis motus in eo apparet; quando vero jam ex se non habet aliquem motum sed movetur tantum ab alio, tunc dicitur animal mortuum per defectum vitae.' I^ae^ xviii, 1, *c.*

Cause of locomotion is really distinct from the Subject of motion. But in living bodies, which are causes to themselves of their own locomotion, the case is not so clear at first sight; since it is plain that cause and Subject of motion belong to the same supposit, or *principium quod*. Though it is one and the same substance that imparts and that receives locomotion; it is not one and the same organ or member or part. Thus, the legs of an animal impart locomotion to the rest of the body, and the legs receive locomotion from the locomotive faculty, which is itself excited to motion by the will or *quasi*-will. But each of these is really and physically distinct from the other. Consequently, the Efficient Cause of locomotion is really and physically distinct from its Subject.

It should be noted that pure Intelligences, according to the accepted teaching of the School, are also capable of a kind of locomotion, which is however specifically distinct from that of bodies. This question will be before us presently.

DIFFICULTIES.

I. The first objection is directed against the first member of the *Minor*. It does not seem to be true, that in every accidental change the Efficient Cause is physically distinct from the Subject of the change. For, if water has been heated by an extrinsic cause; no sooner is it removed from the action of such cause, than it begins of itself to return to its native temperature. Its natural coolness, then, informs the water anew, without the intervention of any extrinsic agent. No other cause, therefore, can be assigned for this accidental change, than the water itself which is the Subject of the alteration.

Answer. This return of the water to its primitive coolness belongs, metaphysically speaking, to natural resultance; in which case,—as has been shown in the *two hundred and fifty-eighth* Proposition,—it is not necessary that the proximate Efficient Cause should be really distinct from the Subject of the effect.

II. The second objection is directed against the third member of the *Minor;* in so far as it asserts that, in the spontaneous locomotion of animals, the proximate Efficient Cause is really and physically distinct from the Subject of the locomotive action, forasmuch as one part causes the motion in another part. Against this position the following argument is urged. Such transfer of

bodily motion cannot be carried back in an infinite series; for no such series can have place in a chain of causes that follow an absolute order. We must necessarily, then, arrive at some first part which initiates the movement. This first part must either impart movement, itself unmoved, or receive movement from some other. The former of the two alternatives is impossible; for there is no body that imparts motion, but has previously received it. The latter alternative is destructive of the hypothesis, that the said part is first in the series. The only possible explanation is, that this part receives motion from some extrinsic causality. If so, the locomotion is not spontaneous. There is, therefore, no difference between the locomotion of animate and inanimate bodies.

Answer. This objection requires and merits elaborate treatment; not only on account of its own intrinsic weight, but likewise because it leads the way to a special point in the Angelic Doctor's teaching on the subject of Efficient Causality, which is of no little interest and importance. Let us begin the discussion with the following quotation. 'Aristotle,' writes St. Thomas, 'points out an order in locomotion; and he says that three things are discoverable in locomotion. One is, the something that imparts motion; and another is, the organ by which the motor imparts motion; and the third is, that which is moved. Now, the motor is twofold; one is immoveable, and the other both imparts and receives motion. Wherefore, in the locomotion of an animal, that which, itself unmoved, imparts motion is the actual good which moves the appetite, as being cognized or imagined. That, again, which imparts and receives motion is the appetite itself; because everything that desires, so far as it desires, is moved; and the desiring itself is a certain act or motion. . . . That which is moved is the animal. Further: The organ by which the appetite imparts motion is bodily,—viz. that which is the first organ of motion. Wherefore, we must take into consideration such organs, in operations common to soul and body[1].' The last observation of St. Thomas—inter-

[1] 'Assignat' (scil. Aristoteles) 'ordinem motus; et dicit quod tria sunt quae inveniuntur in motu. Unum, quod est movens, et aliud est organum quo movens movet, et tertium est quod movetur. Movens autem est duplex; unum quidem immobile, et aliud est quod est movens motum. In motu igitur animalis, movens quod non movetur est bonum actuale, quod movet appetitum prout est intellectum vel imaginatum. Sed movens motum est ipse appetitus; quia omne quod appetit, inquantum appetit, movetur, et ipsum appetere est quidam actus vel motus, prout

preted more particularly by the nature of the Philosopher's treatise, on which he is commenting in the passage here quoted—seems to suggest, that the present objection may be regarded under a twofold aspect, viz. metaphysically and physically. Anyhow, it will be useful so to consider it.

i. If we look at the question from a metaphysical point of view, the term *motion* must be understood to include every species of motion, spiritual no less than bodily. From such a standpoint the solution is patent; and it is in fact suggested by the above quotation. In the locomotion of animals, (for it is this kind of motion which is being discussed by Aristotle and St. Thomas in this Chapter of the *De Anima*), there are three elements,—to wit, a primary cause of motion, itself immoveable; and this is the particular good that is *hic et nunc* present to the soul. The second is that which is simply receptive of the motion and not a cause of it, which is the body. Intervening between these two is the third element, receiving motion from the one and imparting motion to the other. Such is the appetitive faculty. Hence, here is metaphysically the first cause of locomotion, itself unmoved. There is, however, one seeming objection to this solution. According to the hypothesis, the first motor is extrinsic to the animal, because it is supposed to be some external good that moves desire; and this —as is justly urged in the objection—would banish spontaneity of motion. But St. Thomas has already supplied us with the answer. It is not the said good, as it is in itself objectively, that moves desire; but the good as cognized by the intellect or, as in irrational animals, represented by the imagination. To illustrate: A man takes it into his head, that a certain house is an eligible one for his present needs. After deliberation, his first impressions are confirmed; and he begins to desire its possession. Accordingly, the next morning he goes off to the house-agent, with the intention of arranging for a lease. Again: The plentiful rich clover of a neighbouring field strikes the imagination of some horse turned out in a paddock. The appetite is aroused; and over the fence leaps the animal, to indulge in the coveted repast. Viewing the matter,

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motus est actus perfecti, prout dictum est de operatione sensus et intellectus. Quod autem movetur est animal. Organum autem, quo appetitus movet, est aliquid corporeum, scilicet quod est primum organum motus; et ideo de hujusmodi organis considerandum est in operationibus communibus animae et corporis.' *Comm. in L.* iii, *De Anima, Lect.* 15, *p. m.*

then, on its metaphysical side, there is no difficulty in determining what is the first principiant of locomotion in animals.

ii. But it now behoves us to consider the question from a purely physical point of view; and it is here that the objection presses. It may be all very well to contemplate the body metaphysically, as an integral whole exclusively receptive, not communicative, of movement; but physically it is not so. Part acts on part, faculty on organ; and, as there is a last, beyond which there is no communication of motion, so there must be a first, from which motion physically begins. The conclusion is just; and both are assignable. In man and the higher orders of animals, the legs or their homologues are the last causes of locomotion; and the integral body is the ultimate recipient of the same. The legs receive the motion from the muscles, the muscles from the nerves, the nerves and vital spirits from the brain and heart. Thus, the brain is the first to communicate motion, in the ordered series of physical parts. But the difficulty is as pressing as ever. How does the brain impart motion to the rest? As a mere bodily organ it cannot impart motion, unless it be first moved itself. Either, therefore, it is not first, or animal locomotion is not spontaneous. In order to meet this final difficulty, another point has to be taken into account. Wherefore,

iii. In all vital action '*the operations*'—to repeat the words of St. Thomas—'*are common to soul and body.*' You cannot separate the energizing of the two, as though they were capable of developing into two independent series of actions. The faculties of the soul that are acts of the body cannot function without the bodily organs; and the bodily organs, without the soul and its faculties, are as incapable of locomotion or any other vital action as a lump of chalk. A body cannot move itself from place to place, without a locomotive faculty. A corpse cannot move, though still in possession of all the requisite organs. But the locomotive faculty is a property of the soul; and it is the locomotive faculty that is first physical principiant of motion. Against this explanation it may be urged, that in such case the brain would not be the first motor; because itself is moved by the faculty. The objection must be met by a distinction. It is at once granted, that the brain is not first motor in the integral animal and its vital operations. It would be curious if it should be. For,—to say nothing of the fact that a purely corporal entity, whether an integral whole or a part, can never

cause motion of itself,—it stands to reason, that the action of the substantial form, which determines the specific nature of the body, should likewise determine the functioning of the organs proper to the informed body. Nevertheless, the brain is the first *organ* that communicates the motion; since there is no other *bodily* part that incites it to activity. The motion which it receives comes from another nobler order of causation. But, as it may once more be urged, if this is the right explanation, it follows that motion is communicated to the body from without; and thus once more it is shown not to be spontaneous. To this we reply, that the motion is extrinsic to the mere body, (if you will), but not to the living body; in other words, it is extrinsic to the body, considered as an incomplete substance by itself,—as all motion must be,—but it is not extrinsic to the integral composite substance. It is thus only, that the locomotion of living bodies is distinguished from that of inanimate bodies. The cause of motion is intrinsic, and the motion itself is spontaneous in living things, because of the life; and the cause of motion is extrinsic, and the motion itself enforced in all inanimate things, because of the absence of life. If in the last analysis it is pressed upon us, that the faculty, as being a faculty, must itself be first moved; our answer is, that this takes us out of the range of physics into the sphere of psychology, ethics, metaphysics, as the case may be: And so the question has been treated under the first Number.

PROPOSITION CCLXIII.

In the locomotion of purely spiritual Intelligences, the Efficient Cause is not physically distinct from the Subject of such motion; although a metaphysically real distinction between the active and passive potentiality may be reasonably admitted.

Prolegomenon I.

The introduction of this Thesis is required, to complete the treatment of the subject-matter of the Section; but the whole question touching the existence and nature of Angels, so far as these are pervious to the unaided reason, will be presented for investigation later on. It is here, then, assumed that there are spiritual Intelligences, and that they have the capacity of trans-

porting themselves from place to place, though not in the way of bodily motion, but after an incomparably higher manner.

Prolegomenon II.

In order to a right understanding of this Proposition and, more particularly, of the arguments by which it is supported, it will be necessary to give a synoptical idea of what is meant by the locomotion of a pure Spirit, as well as of what is meant by the location or *ubication* of the same. There are certain subsidiary problems, connected with this subject, about which there is a difference of opinion in the Schools; but they will be omitted here. That which is essential to the present need is contained in the three following quotations from the Angelic Doctor: (i.) 'An Angel is said to be in a place, forasmuch as he is attached to the place by virtue of his operation; and seeing that he is not in different places at one and the same time, for this reason the succession of such operations—by virtue of which he is said to be in different places—is called his movement[1].' (ii.) 'To be in a place, is not predicated *univocally* of an Angel and of a body. For a body is in a place, forasmuch as it is attached to the place by contact of continuous quantity; which does not exist in Angels, though there is in them virtual quantity. Wherefore, an Angel is said to be in a bodily place,'—that is to say, in a place occupied by a body,—'by the application, howsoever, of his Angelic power in some place. Accordingly, it plainly cannot be said, that an Angel is commensurate with place; or that he has position in the continuous. For this belongs to a located body, as being quantitative according to dimensive quantity. In like manner and for the same reason, it cannot be said that he is contained by place. For an incorporeal substance, contingng by its power upon a bodily entity, contains it and is not contained by it. . . . Similarly, an Angel is said to be in a bodily place, not as contained but, after a manner, containing[2].' (iii.) 'The swiftness of

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[1] 'Dicitur enim Angelus esse in loco, inquantum applicatur loco per operationem; et quia non simul est in diversis locis, ideo successio talium operationum per quas in diversis locis esse dicitur, motus ejus vocatur.' 1 *d.* xxxvii, *Q.* 4, *a.* 1, *c.*, *fi.*

[2] 'Aequivoce dicitur Angelus esse in loco, et corpus. Corpus enim est in loco, per hoc quod applicatur loco per contactum dimensivae quantitatis; quae quidem in Angelis non est, sed est in eis quantitas virtualis. Per applicationem igitur virtutis angelicae ad aliquem locum qualitercumque dicitur Angelus esse in loco corporeo. Et secundum hoc patet quod non oportet dicere quod Angelus commensuretur loco, vel quod habeat situm in continuo; hoc enim convenit corpori locato,

the motion of an Angel is not measured by the quantity of his power, but by the determination of his will[1].'

From the above passages the following general principles, touching the locomotion and ubication of Angels, may be gathered. First: Locomotion is not predicated univocally of an Angel and of a body, but analogously; and the principal analogate is *body*. Hence, locomotion is motion in its primary and proper signification. Accordingly, it becomes us to know clearly and precisely what is meant by motion. The Philosopher supplies us with three definitions. 'Motion,' he tells us in one place, 'is an act of the imperfect[2]:' in another place, 'motion is an imperfect act of the Subject of motion[3]:' lastly, 'motion is an act of that which is in potentiality as such[4].' This last is the most explicit and, as such, has been the received one among the Doctors of the School. Nevertheless, the other two are serviceable as helping to illustrate the meaning. In order to evolve the full significancy of the definition, let the Angelic Doctor's commentary upon it lead the way: 'Potentiality and act, since they are among the primary divisions of Being, are in order of nature prior to motion; and these it is that the Philosopher makes use of, in order to define motion. It is observable, then, that one thing may be in act only; another, in potentiality only; and a third, in a state midway between pure potentiality and perfect act. That, then, which is in potentiality only, is not as yet subject to motion. That which is already in perfect act, is not Being *actually* subject to motion; but has been previously in motion. Accordingly, that is in actual motion, which is in a state midway between pure potentiality and act; since it is partly in potentiality and partly in act, as is clearly seen in accidental change. For, when water is warm only in potentiality, it is not yet in motion. When it has been heated; the motion of heating is at an end. When, however, it already participates somewhat, though imperfectly, of

prout est quantum quantitate dimensiva. Similiter etiam non oportet propter hoc, quod contineatur a loco; nam substantia incorporea sua virtute contingens rem corpoream continet ipsam, et non continetur ab ea; anima enim est in corpore ut continens, et non ut contenta; et similiter Angelus dicitur esse in loco corporeo non ut contentum sed ut continens aliquo modo.' 1^{ae} lii, 1, *c.*

[1] 'Et propterea velocitas motus Angeli non est secundum quantitatem suae virtutis, sed secundum determinationem suae voluntatis.' 1^{ae} liii, 3, 1^{m}.

[2] 'Η γὰρ κίνησις τοῦ ἀτελοῦς ἐνέργεια ἦν. *De Anima, L.* iii, *c.* 7, *init.*

[3] Ἔστι δ' ἡ κίνησις ἐντελέχεια κινητοῦ ἀτελής. *Phys. L.* viii, *c.* 5, *p. m.*

[4] Ἡ τοῦ δυνάμει ὄντος ἐντελέχεια, ᾗ τοιοῦτον, κίνησίς ἐστιν. *Phys. L.* iii, *c.* 1.

the heat, it is then moved towards heat; for that which is in course of being heated by little and little, participates in the heat more and more. Wherefore, the imperfect act itself of heat, existing in that which is capable of receiving (more) heat, is motion; not considered merely as in act, but as that which, already existing in act, has an ordered relation to a further act. For, if the ordered relation to a further act were removed, the act (however imperfect) would be the term, and not motion; as happens when a thing is made lukewarm. Now, ordered relation to an ulterior act is incident to that which is in potentiality to such act. In like manner, if the imperfect act is considered merely in ordered relation to its ulterior act,—that is to say, as having the nature of a potentiality; it has not the nature of motion, but of a principiant of motion. For, as calefaction can begin with that which is cold; so likewise can it begin with that which is tepid. Thus, then, an imperfect act has the nature of motion, as well by reason of its being compared to the ulterior act, *as a potentiality;* as likewise by reason of its being compared with something more imperfect, *as an act.* Hence, it is neither a potentiality of that which exists in potentiality, nor an act of that which exists in act; but it is an act of that which exists in potentiality. By its being denominated an *act*, therefore, is expressed its relation to a previous potentiality; and by its further denomination, *of that which exists in potentiality*, is expressed its ordered relation to an ulterior act[1].'

[1] 'Potentia autem et actus, cum sint de primis differentiis entis, naturaliter priora sunt motu, et his utitur Philosophus ad definiendum motum. Considerandum est igitur, quod aliquid est in actu tantum, aliquid vero in potentia tantum, aliquid vero medio modo se habens inter potentiam puram et actum perfectum. Quod igitur est in potentia tantum, nondum movetur; quod autem jam est in actu perfecto, non movetur, sed jam motum est. Illud igitur movetur, quod medio modo se habet inter puram potentiam et actum; quod quidem partim est in potentia, et partim in actu, ut patet in alteratione. Cum enim aqua est solum in potentia calida, nondum movetur; cum vero est jam calefacta, terminatus est motus calefactionis; cum vero jam participat aliquid de calore sed imperfecte, tunc movetur ad calorem: nam quod calefit paulatim participat calorem magis ac magis. Ipse igitur actus imperfectus caloris in calefactibili existens, est motus; non quidem secundum id quod actu tantum est, sed secundum quod jam in actu existens habet ordinem in ulteriorem actum; quia si tolleretur ordo ad ulteriorem actum, ipse actus quantumcumque imperfectus, esset terminus, et non motus: sicut accidit cum aliquid semiplene calefit. Ordo autem ad ulteriorem actum competit existendi in potentia ad ipsum. Et similiter, si actus imperfectus consideretur tantum in ordine ad ulteriorem actum, secundum quod habet rationem potentiae, non habet rationem motus, sed principii motus: potest enim incipere calefactio, sicut a frigido, ita et

Of this clear and precise statement of the Angelic Doctor the following is an explanation, and at the same time an application to the matter in hand. Absolutely, bodily motion is neither a simple act nor a simple potentiality; but it is something between the two,—an act of that which is existing in potentiality. It is not absolutely an act, because it is imperfect; it is imperfect, because it essentially denotes a necessary receptibility of further perfectness. Neither is it absolutely a potentiality; because it is an act, as far as it goes. It is the act of a prior and inferior potentiality; but it is likewise in potentiality to a further and more perfect act. If there were not an act of some sort, the entity would be purely potential; and there could be no motion. If there were no potentiality, the entity would be in its complete act, and consequently, at rest; so that again there could be no motion, though there would have been previous motion. To borrow the instance of St. Thomas: If the water is quite cold, it evidently cannot be at the time subject to the motion of heat. If it is boiling, it has reached (we will say) the maximum. The motion of heating has ceased; for it is supposed that the water cannot go on to higher degrees of heat. But we will now put the water at 90° Fahr., and allow it to remain under the action of the fire. It is in act, up to the ninetieth degree of heat; and in potentiality to the rest, up to the two hundred and twelfth. If, having attained to the ninetieth degree, the water is subtracted from the action of the fire; it is no longer existing in potentiality to the other higher degrees, and the motion ceases. The act of heat is complete. To take one other instance from locomotion: A man sets out on a journey to Manchester from London. He reaches Rugby. He is in act relatively to Rugby, but in potentiality as to Manchester. He arrives in Manchester at last; the motion ceases. If he should change his mind at Rugby, and determine to stay there; his journey is practically complete, and motion is over. Such is bodily locomotion; and bodily locomotion is the principal and type of all physical motions. Now, the loco-

a tepido. Sic igitur actus imperfectus habet rationem motus, et secundum quod comparatur ad ulteriorem actum, ut potentia, et secundum quod comparatur ad aliquid imperfectius, ut actus. Unde, neque est potentia existentis in potentia, neque est actus existentis in actu, sed est actus existentis in potentia; ut per id, quod dicitur actus, designetur ordo ejus ad anteriorem potentiam; et per id, quod dicitur in potentia existentis, designetur ordo ejus ad ulteriorem actum.' *Comm. in L.* iii, *Phys. Lect.* 2ª, *init.*

motion of a spiritual Intelligence is of a very different order. His presence in a place is defined, according to the Angelic Doctor, by his operation on the body that occupies the place; for he, like everything else, must necessarily be present wheresoever he operates: God Himself is the great Archetype of this universal law. But his presence is by his operation; and his operation is his will in act. Hence, there can be no motion, in the sense defined. For the act of a spirit is not a process; neither does it admit of more and less. It is instantaneous, and perfect according to the specific perfection of the Intelligence. There is this similarity, however, between the locomotion of Angels and that of bodies, which justifies the analogy; viz. that in both instances there is a change of presence from one place to another. This, then, is the first general principle touching the locomotion of Angels.

The second is intimately connected with the first; and it is this. *Ubication* is not predicated univocally of an Angel and of a body, but analogously; and again the principal analogate is *body*. What, then, is this ubication of a body? In what does it consist? It would not be convenient to forestall discussions, which find their appropriate place under their own Category; so that the following summary of the teaching of St. Thomas on the point must be accepted as a Lemma from the *eighth* Book. Ubication is the term of locomotion; and denotes the constitution of a body in some definite place. It is, accordingly, an accident attributed by an extrinsic denomination to the body placed. But what then is place? For it is place from which, as may be seen, body receives this denomination. 'Place,' says St. Thomas, 'is the superficies of the immediately containing body, in the order of this latter's relation to the primary' (or ultimate) 'containing body[1].' The last clause in this definition has been added by the Angelic Doctor, in order to designate the formal, as distinguished from the material, mensurating superficies. For,—to borrow his illustration,—if a man is standing in a river; the superficies of the stream that immediately surrounds him, and is in physical contact with his body, constitutes his place. Now, if we consider the said superficies *materially*,—that is to

[1] 'Quod locus sit superficies corporis continentis; . . . superficies corporis immediate continentis . . . ex ordine ad primum continens.' *Quol.* vi, *a.* 3, *c.*

say, in its own nature as part of the stream,—it is obvious that it changes every moment. Wherefore, the superficies so understood could not determine the man's place; otherwise, he would be changing his ubication every instant, although he is supposed to be standing still. But the superficies, *formally* considered as measure of the man's ubication, is itself determined by that which proximately and fixedly contains it as a geometrical superficies,—say, the river's banks and bed; and, in ultimate analysis, by the first measure in order of nature,—the all-containing superficies of the material universe, itself without actual, though not without virtual place. From the above statement it will appear, that the mensurating superficies may be considered in relation to two terms. As superficies of the locating body, it is a qualitative mode terminating the extension of such body; as measure of place to the contained or located body, it is source of the extrinsic denomination of this latter, and of the determination of the same under the Category of Place. It follows from the nature of ubication as just explained, that every substance capable of ubication must be extended,—in other words, it must be a material substance, or body. For a superficies is a limit of quantity; and cannot become the formal and immediate determining measure of that which is essentially banished from its own Category. Hence the obvious conclusion, that a pure Intelligence cannot be ubicated in the univocal meaning of the term. An Angel has thus much in common with a body, that he neither is nor can be everywhere at once; that he is capable of being substantially and immediately present now in one place, now in another; and that, as a consequence, his presence is limited. But his ubication differs in every other particular from that of a body. An Angel is present in a place, by virtue of his substantial nature; a body is present in virtue of its quantity. In the instance of the former, place is predetermined by the body that is Subject of his action, and is only predicable of him in connection with such body; in the instance of the latter, place is a proper measure connoting quantitative dimensions. The former wholly occupies each point in the contained space, as completely as he occupies the whole; the latter occupies it by parts, so that one part of the body is where another is not, and the place of the body is the sum of the places of its several parts, (which is the reason why it is capable of *position*). Hence, the presence of an Angel is defined by place; the presence

of a body is circumscribed by place. Accordingly, the presence of an Angel contains place, as something foreign that accidentally terminates the act of will; the presence of a body is contained in place, as in its limiting or determining measure[1].

I. THE FIRST MEMBER of the Proposition,—in which it is asserted *that in the locomotion of spiritual Intelligences the Efficient Cause is not physically distinct from the Subject of such locomotion*,—is thus declared.

To begin with: It is quite plain that the person, or *principium quod*,—that which causes the motion and that which is set in motion,—is one and the same; for the Intelligence whose will causes the change of place, is the Intelligence who is made present in the new place. This is common to all living things, as we have seen, for the reason that all their natural motions are spontaneous. But, in the locomotion of pure Intelligences, the formal and immediate cause (the *principium quo*) is not physically distinct from the Subject of motion. For an Angel is a simple substance;—that is to say, he has no physical parts and no physical composition. Hence he, all that he is, moves himself, all that he is; and, all that he is, he is moved. He is present here, he is present afterwards there, by his will commanding; and his will is present by his will. Therefore, his motion is the motion of his entire nature, caused by the will of his entire nature. Again, to put the same argument under a somewhat different form: The *here* and *there*, which are the terms of Angelic locomotion, are the *places* of bodily substances; they are not, so to say, native to the pure Intelligence. His own *here* is the limitation of a finite spiritual presence. The locomotion of an Angel, then, is a change of presence from one bodily ubication to another. But how is he present? By the simple virtue of his operation. How does he operate? By the efficacious mandate of his will. Therefore, the Efficient Cause of his so-called locomotion is his will. But his will is *physically* indistinct from his nature, or substance; and it is his substance, which by the motion of his will is present now in one place, now in another. It may be truly said, therefore, that physically speaking his nature is cause and Subject of motion.

II. THE SECOND MEMBER,—in which it is affirmed that, in the instance of the locomotion of spiritual Intelligences, *a metaphysically real distinction between the active and passive potentiality may be reasonably admitted*,—is thus declared.

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[1] See, in confirmation of the above statements, *Quol.* ix, *a.* 10; vi, *a.* 3.

The proof of this Member of the Proposition would be easy enough; if it could be admitted that, metaphysically considered, the essential nature was the formal Subject of locomotion, and the will the Efficient Cause. But there are very weighty reasons for denying such a statement; among which not the least is, that, if such were the case, the essential nature of an Angel (which is purely an act) would include in itself a passive potentiality that is accidental even in its term. Besides, an essential nature, in immaterial and material substances alike, acts, and receives act, only through and in its accidents. Even in the hypothesis that the active properties, or faculties, are physically distinct from the essence; there is, at the least, equal reason for concluding that the passive properties are the same. If the substantial form is satisfied by its first act of specific being; there is less reason why it should be considered Subject, rather than cause, of accidental action. Neither can any real metaphysical distinction be admitted between the will as active, and the same will as Subject of the resultant locomotion. At the most, it is a conceptual distinction founded in a reality. Where, then, is this real metaphysical distinction to be found? The following words of St. Thomas will lead us on towards its discovery. 'An Angel,' he writes, 'acts on these bodies'—earthly bodies—'moving them locally by a mandate of the will. But such mandate is not to be understood apart from an active virtue, which must in some way or other be in contact with the body that is moved; since the cause and the Subject of motion must be together, as is proved in the seventh Book of the *Physics*[1].' From these words it would appear, that in pure Intelligences the will is metaphysically equivalent to two faculties, which in man are physically distinct. The one is that spiritual appetitive faculty which has a pure volition for its term. The other is the energic executive faculty which, when the volition is transient in intention, puts into execution that which has been decided by the will. That there is more than a conceptual distinction between the two, is suggested by the Angelic Doctor, who says, that, 'because the action of the will is limited in proportion to the nature of the essence, it is not necessary that an Angel should be able to effect all that he is able to

[1] 'Angelus agit in haec corpora movendo ea localiter per imperium; sed imperium non dicitur hic sine virtute activa, quam oportet aliquo modo contingere corpus motum; cum movens et motum oporteat esse simul, ut probatur in 7 Physic.' *Quol.* ix, *a.* 10, 2[m].

will[1].' Of these two faculties, then, of the Angelic nature it may be said, that the mandate of the volitional faculty is the cause, and the energic faculty the Subject, of the said locomotion; and that between these two there is a real metaphysical distinction.

COROLLARY.

From the foregoing Propositions it may be gathered, that, in regard of locomotion, there are three orders of entities, distinguished from each other by the nature or degree of their locomotive power. First and lowest come those entities which are not capable of spontaneous locomotion, but are moved exclusively by an external cause. Such are all inanimate bodies. Next in order are entities that are capable of spontaneous motion, yet imperfectly. Part moves part; and thus the entire being is moved, as it were, by accident. Such are all living bodies. Finally, there are beings who are capable of movement from place to place perfectly and wholly. Such are all pure Intelligences. We have here a fresh insight into the admirable gradations of being in the created universe.

PROPOSITION CCLXIV.

In the instance of Efficient Causality that is terminated to an immanent act, not only is the supposit of agent and Subject one and the same; but it is not always necessary, that the formal principiant of causality should be physically distinguished from the formal Subject; though it not unfrequently happens that such distinction exists.

I. THE FIRST MEMBER of the Proposition, viz. that *in such causal actions the supposit of agent and Subject is one and the same*, is evident from the nature of an immanent action.

II. THE SECOND MEMBER,—in which it is asserted, that *it is not always necessary that the formal principiant of causality should be physically distinguished from the formal Subject*,—is thus declared in general. In immanent actions the act, in the greater number of cases, exists in the same faculty that elicits it. But the faculty is

[1] 'Quia actio voluntatis limitatur secundum modum essentiae, non oportet quod Angelus possit agere omnia quae potest velle.' *Quol.* vi, *a.* 2, 2[m].

the formal cause of the act. Therefore, the formal principiant, in such instances, is really identical with the Subject. Thus, thought is in the intellect; volition and choice in the will.

III. The third member,—viz. *it not unfrequently happens that a real physical distinction exists between the Efficient Cause and the Subject in immanent actions*,—is thus inductively evinced. In the acts of sensile perception, of imagination, and in all the acts of vegetative life, considered exclusively as immanent, the Efficient Cause is the faculty simply; while the Subject is the composite of faculty and organ. Reference is here made to the proximate formal Efficient Cause and the proximate Subject; though the statement holds equally good of the principal Efficient Cause and the adequate Subject. But a more elaborate explanation of these last two members will appear in the general conspectus of the question, reserved to the next Thesis.

PROPOSITION CCLXV.

The opinion that, in the immanent acts of thought and will, there is a metaphysically real distinction between the formal proximate Efficient Cause and the formal Subject, is not destitute of probability.

Prolegomenon I.

Omitting the acts of vegetative life (about which there can be no question), immanent actions belong to perception or appetite; and each of these may be either intellectual or sensile. Hence, there are four kinds of immanent acts,—viz. cognitions, sensile perceptions, volitions and wishes, sensile desires.

Prolegomenon II.

These several acts, considered purely as immanent acts, exclude all referribility to any external object that may have provoked the act. They are here treated as psychical facts, apart from any ulterior connection.

Prolegomenon III.

The formal principiant, or *principium quo*, is twofold; as has been already stated at the commencement of this Chapter. There is the *primary* formal principiant, which in the instance of immanent actions is the soul; and there is the *proximate* and *subsidiary*, which

is the particular faculty. The one is substantial; the other, accidental.

PROLEGOMENON IV.

Beginning with the consideration of the primary formal principiant and the adequate Subject (for the two are correlative), in each of these classes of immanent actions, the following positions may be regarded as certain: (i.) In all immanent actions of intellectual perception and of intellectual appetition,—that is to say, in all concepts, cognitions of the mind, and in all wishes, volitions, choices of the will,—the primary formal principiant and the adequate formal Subject are physically and metaphysically identical. Both are equally the soul. In this conclusion the soul of man and spiritual Intelligences are indifferently included. (ii.) It is all but equally plain, that in sensile perceptions and desires, considered simply as immanent acts, the said principiant and adequate Subject are really and physically distinct. For the former is the soul alone; whereas the latter is the integral composite of soul and body.

PROLEGOMENON V.

If we now turn to the consideration of the proximate and subsidiary Efficient Cause and that which is formally the Subject; it will appear that, in the instance of sensile perceptions and desires, the said Efficient Cause and Subject are really and physically distinct; and, in the same way and for the same reasons, that in their case the primary principiant and adequate Subject really and physically differ. For the proximate principiant is the sensile faculty; while the Subject, formally such, is the composite of faculty and organ, as declared in the previous Thesis.

PROLEGOMENON VI.

This brings us to the immediate problem before us,—one sufficiently implex and difficult,—which is this: Whether there is any distinction between the proximate Efficient Cause and formal Subject, in the acts of the spiritual faculties of intellect and will. If there is; of what nature is the distinction? It may be accepted as evident, that there is no real physical distinction. Is it probable that there may be a real metaphysical distinction? Such is the question that awaits us.

I. THE FIRST MEMBER,—which reads thus: *The opinion that, in the*

immanent acts of thought, there is a metaphysically real distinction between the formal proximate Efficient Cause and the formal Subject, is not destitute of probability,—is thus declared.

In order to be able to make the proposed declaration intelligible to the general reader, the teaching of the School touching the genesis of ideas must be to some extent understood. It will here, therefore, be briefly given as a Lemma from Ideology. To limit ourselves, for the sake of clearness, to the direct concept of an external object. The intellect, which hitherto has been purely facultative, evidently needs to be determined to the representation of *this* external object in particular; otherwise, there is no more reason why it should represent this, rather than any other truth. This determination consists in the due presence of the object to the faculty. Such presence is initiated after a most imperfect and rudimentary manner by the sensile species, or impression in the senses of the soul. By it, at the least, object and Subject are brought together within the limits of one simple substance. But the sensile species, alone, is not enough for the due presence of the object. The reason in brief is this,—that there is an essential disproportion between the sensile photograph of the object and the intellectual faculty. The former exhibits a commonwealth of mere material accidents; the latter is intuitive only of essence, which is not to be found even initially in the sensile species, except under the bare notion of unity. According to the peripatetic teaching, then, this defect is supplied, and the due presence of the object secured, in the following manner. The intellect in its entirety consists of two principal faculties,—the acting intellect (*intellectus agens*) and the potential intellect (*intellectus possibilis*). The former is not in itself cognoscitive; for such a faculty must be partly receptive, whereas the acting intellect (as its name implies) is purely active. Its one function is to transform, by its light, the sensile into an intellectual species; and it is by means of this latter, that the external object is rendered duly present to the possible, or cognoscitive intellect. The sensile and the intellectual species may be respectively compared to the object-lens and the lenses in the eye-piece of a telescope, as regards two points. The object-lens merely advertizes the eye (when regarding at the ordinary end) of the presence of some *this;* while the lenses of the eye-piece serve to present the object according to its true nature and definite

characteristics. In the next place, no one of the lenses is the object presented to the eye; but is only a medium, by means of which the object becomes normally present, and through which it is seen. Taking care not to carry the comparison too far, we may say that the intelligible species becomes to the intellect the lenses of its eye-piece, through which it intues the object; and that neither the sensile impression nor even the intelligible species is the immediate object of the possible intellect, but the external reality itself. The intelligible species is a qualitative form by which the possible intellect is informed, and is thus rendered proximately capable of evolving its concept.

This preliminary explanation will serve to show the nature of the distinction that intercedes between the potential intellect, as proximate formal principiant of the concept, and the same potential intellect, as formally the Subject of such concept. In its former capacity, it postulates information by the intelligible species; whereas, in its latter capacity, it cannot be considered as including such species, but is in purely passive potentiality to the concept. Accordingly, the potential intellect, as Efficient Cause, includes the intelligible species; which, as Subject of the Concept, it does not include. Hence, the distinction between the two is such as exists between the including and the included.

II. The second member,—viz. *the opinion, that in the immanent acts of the will there is a metaphysically real distinction between the proximate formal Efficient Cause and the formal Subject, is not destitute of probability,*—is thus declared.

The question now presented is beset with difficulties, and has occasioned a diversity of opinion among the Doctors of the School. The more prominent opinions will first be set down; and then certain suggestions towards a solution of the problem will afterwards be added.

i. The first point to be determined is, whether there must be a distinction of some sort between the will as Efficient Cause and the will as Subject of its volition. It would appear as though this question must be decided in the affirmative; for, according to the Aristotelian axiom which has been universally received in the School: *Nothing at one and the same time can be in potentiality and in act relatively to the same.* To this it has been said by some, that the axiom is not rightly understood in this its application to the present problem. It is true, they urge, that mere objective

potentiality of existence is not compossible with the actual existence of the same entity; because existence is not only an individual act, but it cannot in reality be repeated. It is likewise true, that a subjective passive potentiality cannot co-exist with the act that adequately satisfies it; though it may remain partially potential in relation to other acts, when the form that actuates it does not exhaust its potentiality. Thus, matter cannot be in potentiality to the particular form with which it has already entered into composition; but it remains in potentiality to all other whatsoever material forms. Precisely the same may be predicated of the passive potentiality of substance, in regard of accidental forms. In all these last-named instances, the act is not one of simple existence, but either of co-existence or of an added existence in some accidental Category. But, say they, the inquiry assumes quite another phase, when we come to apply the said axiom to active potentialities,—or, as they are otherwise called, powers, faculties, forces. There is much more of entity, and a higher kind of entity, in them than in a passive potentiality. They are essentially active; and become actual by self-actuation. They exist antecedently to their act, while existing completely in their act. Accordingly, it is more true to say that they are terminated to their act, than that they enter into composition with it. Hence, they do not lose their potentiality by their termination to an act; on the contrary, the potentiality is strengthened by its determination to repeated acts. Nevertheless, it must be owned, that to this active potentiality there must exist a corresponding receptivity of act. It is a matter of give and take here, as in every instance of Efficient Causality. But, from the nature of the case, this passive potentiality belongs to the Efficient Cause itself. The act of a spiritual faculty is its own. The intellect conceives and receives its concept. It energizes and produces within itself. It follows, that the axiom of Aristotle is not applicable to active potentialities. Wherefore, as the same Doctors go on to say, in the instances of faculties or powers there is no absolute or antecedent repugnance to the existence of a real identity between Efficient Cause and Subject; consequently, where there is a real distinction between the two, this arises out of the particular nature either of the faculty or of the act. An act of intellect and will, which is terminated to an external transformation or act of locomotion, is distinguished from the Subject, because the

action is transient; whereas, in their immanent acts, there is no real distinction between the agent and the Subject.

The above considerations are cogent to evince, that there is no real physical distinction between the Efficient Cause and its immediate Subject in these immanent acts; but they fail to prove that there is no real distinction of whatever kind, or that the *dictum* of the Philosopher does not apply to them as to all other causal acts, *servatis servandis*. It matters nothing to the point in question, that the faculty preserves,—nay, strengthens,—its active potentiality by its acts. It has been shown, in the declaration of this opinion, that precisely the same may be predicated of the passive potentiality of matter. There is, moreover, another notable resemblance between these two cases. As matter is no longer in potentiality to the form which *hic et nunc* actuates it; so, in like manner, the active potentiality or faculty is no longer potential of the individual act that it has elicited. Accordingly, the introduction of its facultativeness (if the term may be permitted), in relation to other possible acts, is quite beside the mark. The object of inquiry is the individual act, in its twofold relation to the faculty as effect and form,—as caused and inherent. The faculty, according to the hypothesis and the common judgment of the learned, is at once Efficient Cause and Subject of its act. As the one, it is an active, as the other, it is a passive potentiality. Therefore, a real distinction of some sort there must be; unless active and passive potentiality are mere logical concepts. It is sufficiently attested, that the distinction cannot be physical. Consequently, it must be metaphysical. Once more: Analogy would lead us to conclude that, as there is a real metaphysical distinction between principiant and Subject in the act of the intellect; so a like distinction must be discoverable in the action of the will. The difficulty is, to fix upon the true nature or foundation of the distinction; wherein precisely it consists.

ii. Some have sought for this distinction, in the determination of the will to this or that particular good; somewhat after the same manner as, in the instance of the intellectual act, the distinction is founded in the information of the faculty by the intelligible species. But it is plain,—so Suarez assures us,—that the assumed parity between the two does not hold good. In the case of the intellect, the intelligible species is something intrinsic to the faculty; whereas, in that of the will, the presentation of the object is an

intellectual act and, therefore, extrinsic to the faculty. It cannot possibly, then, be assumed as a partial constitutive of the Efficient Cause, but only as a necessary previous condition. Such is the argument of Suarez against this opinion; its value will be determined presently.

iii. Others there are, who have explained the existence of a real distinction in another way. There is, say they, in the will of man a natural appetition of his end which is the One absolute Good. Such appetition is implanted in the nature of the will. Man's choices, therefore, or free volitions, are exclusively conversant with such particular goods as are means towards this end; and these are the acts which are strictly attributable to the human will. The vital tendency towards the end is a concreation by the First Cause. Wherefore, as these Doctors maintain, the human will, as Efficient Cause of its volition, includes the said natural inclination bestowed upon it by the Author of its nature; whereas, as Subject, it does not include such inclination. This opinion is generally maintained by the Doctors of the Thomist School; but has been rejected by others, for the following reasons. First: It has been urged, that the opinion in question makes God to be Efficient Cause of the tendency of the human will towards its end; whereas man by his own innate efficiency tends towards his end, and not as the mere instrument of another. Neither does such action of the human will postulate other Divine Intervention, than that general Concurrence which is essential to every other finite action. As well might one say that the act of heating, in the instance of fire, is owing to the Divine Efficiency. Secondly: This opinion does not take into account such acts of the will as wishes or velleities, satisfaction in presence of the good, simple love of an apprehended good. Finally: It more particularly fails to explain the action of the sensile appetite, in which there is no formal intention of the end. Such, in brief, are the arguments of Suarez, partly borrowed from Scotus.

If one may with all respect say as much of such grave authorities, the above arguments seem to be quite irrelevant; being based on an erroneous interpretation of the opinion impugned, more particularly as illustrated by the teaching of the Angelic Doctor. There are two ends, so to say, assignable in relation to the human will and, in consequence, two intentions of the end. There is the individual Supreme Good, and—correlative of this objective end—happiness in the final possession of Him. This is one end. But there is like-

wise the good universally,—transcendental goodness,—the good, as universal object of all desire. This is another end. It would seem as though Scotus and Suarez had the former exclusively in their eye; consequently their arguments, however valid in themselves, involve an *ignoratio elenchi.* It is certain, that the actual intention of this End is the act of the human will; and that it is in this life, as will be seen later on, an act of free-will. But the Angelic Doctor is referring to the other end, and to the instinctive tendency towards the good in general. Further: It is to be noticed, that the intention of this end, or the said tendency towards the good in general, may be understood in two ways; as an act, and as an active potentiality. Considered as an act, it essentially enters into the volition, and is doubtless the effect of the human will. But, considered as purely potential, (and thus only can it be deemed intrinsically dispositive of the will as Efficient Cause), it is imbibed in the very constitution of the will; just as the capacity for receiving and representing the true is native to the intellect. In this sense Suarez would surely admit, that the capacity of heating is generated, with the fire, by the causality of the generator of the fire. In the potential desire of the good, the human will is no master. It is bound by an inexorable law, the law of its own nature. Every act of wish, of complacency, of disinterested love, and even of sensile appetite, (so far as it is specifically human, and not merely animal), presupposes this fundamental tendency, and includes it. The will can no more intend the good freely, than the intellect can intend the true freely. This virtual desire for the good is a property of the will; consequently, it is undeniable that it is a resultance of the concreation of the human will by the Creator.

So far, then, it would appear that the Thomist position is impregnable. It is this innate tendency towards that which is howsoever good, that is the natural foundation of the Efficient Causality of the will in its immanent, as well as in its transient acts. But, if we regard the will exclusively as the Subject of its own act, this fundamental tendency is necessarily excluded; because the tendency is essentially active, and the Subject, as such, is as essentially passive. But now comes the crucial question: Does this explanation, taken by itself, offer a full solution of the proposed problem? Before venturing on an answer, let this be well understood: The Angelic Doctor has never himself proposed it as a

solution of the present difficulty, which he has not discussed at all. While, then, the writer would yield to none in his deference towards that illustrious School of Doctors, which is represented as maintaining the opinion under discussion; he is compelled to confess that to his mind the explanation, while affording a partial solution, does not fully satisfy the difficulty. The inquiry does not limit itself to volitional action in general and (so to say) in the abstract, but to each individual act of the will as a distinct causal effect. Supposing the question to be limited in the former of these two ways, we might with equal justice say of the intellect, that, as Efficient Cause, it includes an essential tendency to embrace and represent to itself truth, wherever it is discoverable; without mention of the intelligible species, by which it is rendered proximately capable of eliciting such or such concept. Indeed, in this respect there is a close parallel between the two faculties. But, as in the case of the intellect, the inquiry turns upon the faculty, considered as in proximate disposition for eliciting the individual act, as its Efficient Cause; so, in the matter of the will, it becomes us to see, whether there is a proximate disposition of the faculty for eliciting its act, resembling the information of the intellect by the intelligible species.

iv. Before essaying a tentative solution of this last point, it will be expedient, with the view of obviating certain possible objections, to interpose a remark on the nature of the relation between intellect and will. Suarez, as we have seen under the second Number, has objected to the opinion there given, that the act of the intellect is extrinsic to the will; and can therefore only be regarded as a condition of volition, not as an intrinsic disposition of the will. Now, we put in a demurrer to this proposition, as it stands without any qualification. Metaphysically, doubtless, there is this clear severance of the two faculties; but we more than question, whether in the operations of the will this entitative separation of the two can be physically admitted. The following are our reasons: (1.) An act of volition is impossible *de potentia absoluta*, without an accompanying act of the intellect. (2.) The essential *differentia* which distinguishes the appetite of the will from other appetites consists in this, that the former is intellectual. (3.) Such an intimate connection and all but identity exist between the two; that, as St. Thomas repeatedly reminds the reader, the Philosopher was in doubt whether to define the will to be *appetitive intellect* or

intellectual appetite. It is hard to reconcile this teaching of Aristotle and St. Thomas with the unqualified statement, that the action of the intellect in volition is only a necessary condition; seeing that, according to that teaching, it is imbibed into the essence of the act. To put the argument in form: That which constitutes the *differentia* of an act of the will, and essentially distinguishes it from the act of other appetites, is not a mere condition of such act. But its being intellectual is, according to Aristotle and St. Thomas, this *differentia.* Therefore, etc. Further: That which is essential to a property of free-will, so that with it the property exists, and without it does not and cannot exist, is not a mere condition. But responsibility is a property of an act of free-will; and it exists with the intellectual act, and cannot exist without it. Therefore, etc. The *Minor* is a Lemma from ethics. The following objection may, however, be made to these apparently solid conclusions: It cannot be doubted, that there is a real distinction between these two faculties. For the action of the intellect is, in itself, independent of that of the will. Then, their respective formal objects are quite distinct; since truth is the object of the one, goodness of the other. Lastly: Their mode of operation is distinct and, to a certain extent, opposed. The intellect receives its object in itself; the will goes out of itself, so to say, in tending towards its object. It cannot be doubted, that there is a real distinction between the two faculties; just as a real distinction, of some sort, must be admitted between the faculty of understanding and that of reason. But does this in either case amount to a physical distinction? There is, evidently enough, a distinction of order; for the intellect is prior in order of nature to the will, just as the true is nearer to being than the good. For this reason the good essentially presupposes the true; but the true does not presuppose the good. Anyhow, according to the two great authorities already quoted, the will is the appetite of the intellect; so that the difference between them resembles the difference between the including and the included. The intellect can function, apart from the will; but the will cannot *de potentia absoluta* function, without the intellect. To abstract, therefore, the action of the intellect from volition, is to rob volition of its essential characteristic, and to confound it with the act of an irrational appetite.

If these conclusions are warranted by reason as well as by the

doctrine of the peripatetic and Scholastic philosophy; it will not be considered over-venturesome, if we offer to the consideration of those who are far more competent to decide, a possible solution of this most interesting problem. The human will, then, as Efficient Cause, includes two elements which it does not include, as Subject of its act. First of all, it includes that vital tendency towards good in general, which is a resultant property of the will and the main-spring of all volitional acts. So far, the solution is in harmony with the opinion generally entertained by the Doctors of the great Thomist School. But, over and above this, it contains its essential *dirigibility*—to coin a new word—by the intellect, either as understanding or as reason; as understanding, by intuition of the good in wishes, complacencies, specific volitions; as reason, in the elections of free-will. It is thus,—as it would seem,—and thus only, that the will is proximately disposed for eliciting its act; since it is only through the intellect, that it can be prepared for tending towards its formal object,—the particular good, as set before it. This is verified even in the instance of sensile desires, is so far as they are under the direction of the will. These, however, would connote transient acts of the will, with which we are not now concerned, and about which there can be no difficulty, in connection with the problem before us. If, on the other hand, the sensile appetite is considered exclusively as it is in and of itself, it is indifferently in man as in all other animals; and the distinction between the faculty, as Efficient Cause, and its Subject is physically real. Thus much, at least, may be said on behalf of the suggestion here offered; that it accounts for the proximate disposition of the will, as Efficient Cause, for eliciting each individual act of whatever kind, and that it notably harmonizes with the previous solution touching intellectual efficiency. However this may be, it seems little consonant with the analogy of nature or with the unity of philosophic truth, to maintain with Suarez, that the operations of the human will form a solitary exception to the *dictum* of the Philosopher and to the established order in Efficient Causality.

Certain general Corollaries.

From the preceding conclusions certain Corollaries may be drawn, which will afford a synoptical answer to the question that stands at the head of the present Section.

Corollary I.

It is not essential to causal efficiency, that the supposit of an Efficient Cause, as such, should be physically distinct from that of the Subject of its causal action. Consequently, where such distinction exists; it does not arise from the nature of an Efficient Cause, as such, but from the specific nature of the particular cause.

Corollary II.

It is not necessary that the Efficient Cause should be really distinguished from the Subject, by virtue of a physical distinction either of substantial or of integrating parts. Consequently, where such distinction exists, it does not arise from the nature of an Efficient Cause, as such; but is due to some special reason, peculiar to the said cause.

Corollary III.

It is not essential to an Efficient Cause, as such, that the active causality and the Subject of causal action should be physically distinguished, either in their entire or partial entity. Hence, when such a distinction is apparent; it is to be attributed to the peculiar nature of the cause. It has been objected against this Corollary, that no entity can stand in a real relation to itself. But an Efficient Cause is really related to the effect, which is something really new in the Subject. Therefore, if the above Corollary were true, an Efficient Cause would be really related to itself. For answer: It is admitted that there exists a real relation between the Efficient Cause and its effect; and that, as a consequence, there must be a real distinction between the two. But there is likewise a real distinction between the Subject and the effect; so that a physical identity between cause and Subject would not interfere with a real distinction between cause and effect. On the other hand, there is no necessary relation between cause and Subject.

Corollary IV.

In every instance of Efficient Causality, it is necessary that there should be, at least, a metaphysically real distinction between the Efficient Cause and its Subject.

§ 2.

IS IT NECESSARY THAT AN EFFICIENT CAUSE SHOULD BE IN CONTACT, OR PHYSICAL CONJUNCTION, WITH THE SUBJECT OF ITS CAUSAL ACTION, IN ORDER THAT IT MAY BE COMPETENT TO EXERT ITS CAUSALITY?

We are about to enter upon a question that demands and merits more than ordinary attention, not only by reason of the many different problems that surround it, but more particularly because of its intimate and delicate relation to certain physical theories, which are more or less commonly accepted in our day. Before entering upon the task that awaits him, the writer wishes to interpose an observation. When a system of metaphysics is developed in the form of Propositions; it is inevitable that the exposition should assume a dogmatic tone which, particularly in the instance of discussions like the present, may tell considerably, in the minds of some, against the position which he maintains to be the true one. Touching the subject now before us in particular, there are certain points, maintained by most modern physicists as little short of axiomatic, which the peripatetic and Scholastic philosophy categorically rejects as scientifically untenable; while, on the other hand, there are certain propositions which the Scholastic philosopher holds as demonstrated conclusions, but have become simply intolerable to a number of our most popular writers on physics and matters of philosophy. There are, besides, other points, (perhaps less prominent), on which Doctors of various Schools, as well as other philosophers ancient and modern, are not agreed. In face of such facts, the reader will be confronted with a series of Propositions which seem to lay down the law, dogmatically determining on one side or the other of conflicting opinions;—and this too, in all probability, in a sense diametrically opposed to his own cherished convictions. The author might fairly put in a plea that, as he announced at the outset, he is merely presenting before the public the philosophy of the School and, in particular, that of the Angelic Doctor, to the best of his ability; in answer to a reasonable appeal made by many thoughtful men scattered among the English-speaking portions of the world, that an opportunity might be afforded them of acquiring some knowledge of this philosophy in their mother tongue. The plea is a good one, because no one can justly complain of the categorical

statement of a fact; but it is not of itself sufficient. For the Propositions that follow are sometimes supported by arguments which, though professedly based on the teaching of St. Thomas, are nevertheless distinctively the author's own. His apology, then, is this. It is in the nature of the method, which has been carefully selected as the best adapted to his purpose, that he should state and defend in categorical propositions those opinions (if such they must be called), which are in accordance with the doctrine of St. Thomas and with his own mature convictions. The same reason likewise serves to explain, why any opinions, opposed to the one he defends, are presented under the form of objections, after the model of the Scholastic Doctors. This must not be understood to imply any intention of passing a slight on such opinions; for it is obviously impossible that they could have found a place in the body of the Thesis. Further: Though the Enunciations are expressed in severe logical form, and undeniably express a certainty of conviction which he has no desire to repudiate; yet nothing could be further from his wish, than that the judgment of the reader should depend on any other motive than the solidity of the proofs that are submitted to him, aided perhaps, in the case of certain more recondite problems, by the authority of the wise in the days of old. Lastly: Though compelled, by the force of what is to him irresistible evidence, to reject as untenable some of the assumed principles that have been forced into the service of certain modern physical hypotheses, which are not unsupported by strong inductive evidence; he feels the less reluctance to do so, since he is confident that these hypotheses are *at least* equally compatible with the metaphysical system here explained and defended, and stand in no need of these *soi-disant* principles with which they have been encumbered.

Having thus endeavoured to prepare the way for an impartial consideration of the discussions that are about to follow, by those who are not confessed slaves to an antecedent prejudice, (and these latter the author does not care to number among his readers); let us now address ourselves to the subject. To clear the ground: There is one preliminary observation that may be made. The present inquiry refers exclusively to *transient* action; for it is quite evident that in *immanent* action the cause must be indistant from the recipient, for the simple reason that the two are physically identical.

It is to be remembered that there are purely spiritual, as well as

material, Efficient Causes. The present inquiry extends to both, though primarily concerned with the latter; and, accordingly, with these it will commence.

There has existed a divergence of opinion in the School, as to whether it is absolutely necessary to the causal action of one body on another, that the two should be in physical contact. Aristotle, together with St. Thomas and his disciples, maintain that it is necessary; while Scotus and the Scotists maintain the contrary. These latter attribute to bodies a certain limited energy, (much like that which moderns have designated *force*); and assert that, within the sphere of this energy, one body can act upon another, though the two are physically apart. Both Schools, however, agree in denying the possibility of a vacuum. According to the teaching of many eminent modern physicists, on the contrary, there is that which has been called a disseminated vacuum throughout all bodies; so that no 'molecule' of material substance is in physical contact with any other, but each acts immediately on each across a surrounding vacuum. A like theory was upheld by the ancient atomists, and is combated by the Philosopher in his *Physics*.

The subject-matter, then, opens up five questions: (i.) Can an Efficient Cause—in particular, a body—act *immediately* upon a distant body; should there exist between the two an intervening vacuum? (ii.) Is it necessary that a body, in order to exercise causal action on another, should be in physical contact with this latter? (iii.) Can one body act immediately upon another distant body, if a third body should intervene between the two? (iv.) How does one body act upon another at a distance, through the instrumentality of an intervening body? (v.) Is contact of some sort necessary, in order that a spiritual Intelligence may be capable of acting upon a body? If so, what is the nature of such contact?

PROPOSITION CCLXVI.

On the supposition that the existence of a vacuum is an impossibility; it is evident, that any question touching the possibility of one body acting on another, when there is an intervening vacuum between the two, would be outside the limits of reasonable discussion.

Prolegomenon I.

The present and succeeding Theses forestall, in some measure, a discussion which belongs to another Book. It is necessary, however,

that at once something definite should be known about *vacuum;* in order to be able to form a competent judgment about the point in dispute. That which now follows in brief must be accepted as a Lemma from the *eighth* Book. Vacuum, according to the definition of the Philosopher, is—or would be, on the supposition of its possibility—'a place deprived of body[1].' It formally consists, therefore, of a privation. It is place,—which is its genus,—with a privation for its *differentia*. It is a place, deprived of that which it essentially postulates as formal condition of its existence. If place were without the placed, it would cease to be place at all. Vacuum, accordingly, corresponds with a somewhat satirical description of it given by the same authority. It would be 'a place in which there is nothing[2].' But this looks very like a contradiction in terms. Hence, as Aristotle pleasantly remarks, 'the idea is as vacuous as the name[3].'

Prolegomenon II.

Among those who agree in denying the possibility of a vacuum, there are some who maintain that its existence is only physically impossible; while others—with whom the author wishes to be numbered—assert that it is metaphysically impossible. The former opinion is quite sufficient for the purpose of this Proposition.

Prolegomenon III.

In addition to the few passing observations touching *place*, which appear in the second Prolegomenon to the *two hundred and sixty-third* Proposition, let the following be added as necessary to our present discussion. 'Place,' according to the Philosopher, 'is the first immoveable limit of the containing body[4].' This definition needs a brief explanation. A body is in place, by virtue of some other body that surrounds or contains it; for every body is surrounded by, and in contact with, some other body, till we reach the ultimate all-containing limit of the material universe. In what sense this same ultimate is itself in place, will be explained in due course. Now, as the interpenetration of bodies is a physical impossibility; the limit of the containing body—that is to say, that extremity of it which is in immediate

[1] Τὸ γὰρ κενὸν τόπος ἂν εἴη ἐστερημένος σώματος. *Physic. L.* iv, *c.* 1, *med.*

[2] Δοκεῖ δὴ τὸ κενὸν τόπος εἶναι ἐν ᾧ μηδέν ἐστι. *Ibid. c.* 7, *init.*

[3] Καὶ καθ' αὑτὸ δὲ σκοποῦσι φανείη ἂν τὸ λεγόμενον κενὸν ὡς ἀληθῶς κενόν. *Ibid. c.* 8, *v. f.*

[4] Τὸ τοῦ περιέχοντος πέρας ἀκίνητον πρῶτον, τοῦτ' ἔστιν ὁ τόπος. *Ibid. c.* 4, *v. f.*

contact with the other—will be likewise the limit of the contained body. For, by virtue of their contact, the two limits resolve themselves into one; because (as Aristotle puts it) 'the extremes of things that are in physical contact are in one and the same[1],' or meet in one. Further: The Philosopher says, that place is the *first* limit of the containing body, in reference to the contained,—in a word, it is the first and nearest limit to the contained body; relatively to the containing body, it is the *last*. Why he has added *immoveable* limit, has been sufficiently explained in the previous Prolegomenon. Place, then, is the limit of the containing body, as it is the measure of the contained; for a body is in place, by reason of its proximate continent. Hence, a body is said to be placed, or in place, by an extrinsic denomination derived from the limit of the containing body.

From the above definition certain conclusions follow, which bear upon the present discussion. First: If a body could be in a vacuum, it would be *nowhere*, for there would be no immediate continent; unless, indeed, any one should care to contend, that a limit might be found, past the vacuum, in the body or bodies proximately near: About which, hereafter. Secondly: In the case of moving bodies, two would not be enough to constitute a place; there must be a third, as measure of immobility. Thirdly: There must be a direct dimensive equation between place and the placed; because the two limits coincide. Lastly: When one body is contained by another in such wise, that the contained naturally shares in the motion of that which contains it, as,—to adopt the Philosopher's illustration,—wine in a decanter; the contained changes its place by accident. For it forms, as it were, a whole in union with the continent; and its place, as part, is really the place of the continent, or outer part. Accordingly, speaking in all strictness, it is the decanter of wine, as a whole, that is carried about from place to place, not the wine alone or the decanter alone; and such is the verdict of common sense.

By way of conclusion to this Prolegomenon, we will record a valuable remark of the Philosopher touching this question. 'The first point to be well understood,' he tells us, 'is this; that no inquiry would have been raised concerning place, if there had been

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[1] Ἐν γὰρ τῷ αὐτῷ τὰ ἔσχατα τῶν ἁπτομένων. *Physic. L.* iv, *c.* 4, *v. m.*

no such thing as locomotion[1].' Further: As the Philosopher adds, in a passage which will be quoted in the next Proposition, locomotion is the primary and, in some sense, the most important species of motion, to which all the other kinds are reducible. Once more: Locomotion is a motion which, from first to last, is subject to sensile perception; whereas other kinds of motion are all but exclusively perceptible in their results or effects. Hence it is reasonable to conclude, that from locomotion we shall be able to obtain experimental knowledge on these matters, which will be of notable service in helping us towards a judgment on the question before us.

Declaration of the Proposition.

The Enunciation is so self-evident on the face of it, as to preclude the need of many words. For, if the existence of a vacuum is even only *physically* impossible; any debating about the possible action of an Efficient Cause across a vacuum would be mere waste of time and words.

Since, however, there have been from the first, and still exist in our time, men of eminence in their own departments, who have strenuously maintained that a vacuum is both metaphysically and physically possible,—nay, more than this, that vacua exist everywhere throughout nature,—and since the impossibility has not as yet been demonstrated; it will be well to see whether, if the physical possibility or the existence of vacua could be proved, the fact would be of any service towards explaining the natural phenomena of motion, and towards determining the controversy concerning the distancy or indistancy of the Efficient Cause from its Subject. Wherefore,

PROPOSITION CCLXVII.

Even in the hypothesis that a vacuum is neither metaphysically nor physically impossible; a body could exercise no causal effect on another body, if there existed an intervening vacuum between the two.

Prolegomenon I.

Mr. John Stuart Mill has pronounced a very decided judgment on the present question. 'Rather more than a century and a half

[1] Πρῶτον μὲν οὖν δεῖ κατανοῆσαι ὅτι οὐκ ἂν ἐζητεῖτο ὁ τόπος, εἰ μὴ κίνησίς τις ἦν ἡ κατὰ τόπον. *Physic. L.* iv, *c.* 4, *init.*

ago,' he writes, 'it was a scientific maxim, disputed by no one, and which no one deemed to require any proof, that "a thing cannot act where it is not." . . . "It is inconceivable," said Newton, in one of his letters to Dr. Bentley, "that inanimate matter should, without the medium of something else, which is not material, operate upon and affect other matter *without mutual contact*. . . . That gravity should be innate, inherent, and essential to matter, so that one body may act on another, at a distance, through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man, who in philosophical matters has a competent faculty of thinking, can ever fall into it." This passage should be hung up in the cabinet of every cultivator of science who is ever tempted to pronounce a fact impossible because it appears to him inconceivable. In our own day one would be tempted, though with equal injustice, to reverse the concluding observation, and consider the seeing any absurdity at all in a thing so simple and natural to be what really marks the absence of "a competent faculty of thinking." No one now feels any difficulty in conceiving gravity to be, as much as any other property is, "inherent and essential to matter," nor finds the comprehension of it facilitated in the smallest degree by the supposition of an ether, nor thinks it at all incredible that the celestial bodies can and do act where they, in actual bodily presence, are not. To us it is not more wonderful that bodies should act upon one another "without mutual contact" than that they should do so when in contact; we are familiar with both these facts, and we find them equally inexplicable, but equally easy to believe. To Newton the one, because his imagination was familiar with it, appeared natural and a matter of course; while the other, for the contrary reason, seemed too absurd to be credited. It is strange that any one, after such a warning, should rely on the evidence *à priori* of such propositions as these, that matter cannot think; that space, or extension, is infinite; that nothing can be made out of nothing (*ex nihilo nihil fit*). Whether these propositions are true or not this is not the place to determine, nor even whether the questions are soluble by the human faculties. But such doctrines are no more self-evident truths, than the ancient maxim that a thing cannot act where it is not, which probably is not now believed by any educated person in

Europe[1].' In this passage Mr. Mill pronounces, that causal action at a distance is a thing simple and natural; and that probably there is not an educated person in Europe now, who holds the opposite opinion. Is this really true? Mr. Herbert Spencer shall speak to

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[1] *System of Logic, B.* v, *ch.* 3, § 3, *Vol.* ii, *pp.* 314, 315, 5*th Ed.* This passage is a fair sample of the way in which its author handles the many metaphysical problems that find a surreptitious admission into his so-called Logic. They are for the most part introduced parenthetically; and thereupon certain peremptory statements are made concerning them, which are supported by no other evidence whatsoever than the *ipse dixit* of the writer, and to those who calmly consider them afford a subject of simple astonishment. In the sentences above quoted, Mr. Mill states as unquestionable truths the following: Sir Isaac Newton was led astray by his imagination, when he deemed it inconceivable that one body should act upon another at a distance without some medium. He asserts that such a phenomenon is simple and natural, while it is at the same time inexplicable,—that the action of body on body, when both are in contact, is equally inexplicable,—that the quoted opinion of Newton is now probably not believed by any educated man in Europe,—that those who maintained it in past times considered it in the light of a scientific maxim which no one deemed to require proof, but included in the class of self-evident truths,—that no one feels any difficulty in conceiving gravity to be inherent in, and essential to, matter,—that no one now thinks it at all incredible, that the celestial bodies can do and act, where they are not. Now (i.) It is just possible that Sir Isaac Newton may have been influenced, like those before him, by what he deemed demonstrative evidence; and that Mr. Mill may have been led astray by sceptical prejudice. At least thus much is reasonably certain, that it ill becomes one of the combatants to decide the victory in his own favour, without showing cause. (ii.) Many philosophers, who would not suffer from comparison with Mr. Mill, have formerly agreed, as now many others still agree, with Newton in considering action at a distance physically and even metaphysically impossible; and therefore would agree with the confession of Mr. Mill, that such action is quite 'inexplicable,' while denying, of course, that it is simple and natural. (iii.) At the time that Mr. Mill wrote, there were eminent philosophical writers in Europe, as there have been since, who maintain the opinion of Newton. (iv.) Aristotle in his *Physics* has given elaborate proof of the said maxim, and has been generally followed in this respect by the Doctors of the School, both before and after the Tridentine Council. The present writer has not come across a single instance of any one who treated it as a self-evident truth. (v.) There are metaphysicians now living, who would probably deny that gravity is essential to matter; even if matter is taken in the vulgar, or unphilosophical, sense in which Mr. Mill uses it. (vi.) Precisely the same animadversion must be made on the assertion, that no one now thinks it incredible that the celestial bodies can act (immediately) where they are not. The undulatory theory of light and heat is a practical protest against so rash an assertion. (vii.) One is curious to know, by which of his methods of experimental inquiry Mr. Mill has gained an inductive certainty, that *no one* thinks this, or has a difficulty about that, in these days. Did he ever look beyond the limits of his own country, or even within these narrow limits complete his survey?

The last paragraph of the passage quoted in the text illustrates another peculiarity in Mr. Mill's polemical *Logic*, which is akin to the *Fallacia plurium quaestionum*. He includes, in a group of examples, some one or two that are introduced as if by

the simplicity and naturalness of the idea. 'How again,' remarks this contemporary writer, 'can we understand the connexion between Force and Matter? Matter is known to us only through its manifestations of Force: our ultimate test of Matter is the

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accident, by means of which method he casts a doubt *per transennam* on a fundamental conclusion of metaphysics, psychology, or ethics. Thus, together with the concept of infinite (i.e. indefinite) space, which is purely ideal, and with the principle *ex nihilo nihil fit* (which becomes ambiguous by the context), he quietly inserts the proposition that *matter cannot think*, without a word to let his readers know that it is not treated as axiomatic, but has been submitted to rigid demonstration. The adoption of this peculiar method of procedure has been candidly explained by an eminent authority, who assuredly would not have been predisposed to be severe with the subject of his animadversions. Mr. Fitzjames Stephens, in an Article contributed to the *Contemporary Review* for February 1875, writes as follows: 'Probably hardly any work of our day has done so much to shake the foundation of theology as Mill's Logic, and if read in the light of its author's *Autobiography*, it is impossible not to believe that this result was intended. I well remember, many years ago, reading of an Oxford student who said that he had read every word of it carefully, and that it contained not one word which was inconsistent with atheism. The remark was perfectly true. . . If any one had said to him, "Why don't you speak out like a man?" . . he would have replied, . . . "You will find in the long run that the zig-zag mode of approach is good in controversy as well as in sieges. The sap and the mine must in time take us into the heart of the place. If we try to storm the town now, we shall simply be knocked on the head."' These, from many points of view, are remarkable words.

There is another animadversion on Mr. Mill's *Logic*, which it is a bare act of justice to make. It may confidently be affirmed that, in all but every instance on which occasion offers itself, or is chosen, to state the doctrine of the School or of Aristotle on some given point, the statement is as nearly as possible the opposite to that which is taught by these Doctors. Let the following references suffice as instances: Book I, ch. 3, § 7; ch. 6, § 2; ibid. § 3; ibid. § 5; Book II, ch. 2, § 2: Book V, ch. 7, § 7; etc. Again: Owing in part to his inveterate habit of making random assertions, in part to the fact that,—as Professor Jevons admits, (*Contemporary Review*, December 1877),—'Mill's mind was essentially illogical;' his work is replete with transparent self-contradictions. 'I undertake to show,' says the same Professor in the same Article, (Mill's Philosophy Tested, No. 1), 'that there is hardly one of his more important and peculiar doctrines which he has not himself amply refuted. It will be shown that in many cases it is impossible to state what his doctrine is, because he mixes up two or three, and, in one extreme case, as many as six different and inconsistent opinions. In several important cases, the view which he professes to uphold is the direct opposite of what he really holds. . . . There is nothing in logic which he has not touched, and he has touched nothing without confounding it.' These are undoubtedly strong accusations; but the eminent Professor has fully justified them in the series of Articles, from one of which the above extracts have been made. It is to be hoped, in the interests of truth, that he will see his way to complete them. If need were; the present writer would be prepared to show, from numerous instances which he has collected, that these patent contradictions are by no means limited to 'his more important and peculiar doctrines.'

The baselessness of Mr. Mill's theory and the practical impracticability of his

ability to resist: abstract its resistance and there remains nothing but empty extension. Yet, on the other hand, resistance is equally unthinkable apart from Matter—apart from something extended. Not only, as pointed out some pages back, are centres of force devoid of extension unimaginable; but, as an inevitable corollary, we cannot imagine either extended or unextended centres of force to attract and repel other such centres *at a distance, without the intermediation of some kind of matter.* We have here to remark . . that the hypothesis of Newton, equally with that of Boscovich, is open to the charge *that it supposes one thing to act upon another through a space which is absolutely empty—a supposition which cannot be represented in thought*[1].' So much for the simplicity of the idea.

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four notorious *methods of experimental inquiry* have been irrefragably established by Mr. Balfour in his *Defence of Philosophic Doubt*,—a work which, for its logical precision, power of analysis, and masterly destructiveness, claims a foremost place among modern contributions towards a saner philosophy.

We cannot do better than conclude this critical note with the indignant protest of Professor Jevons against the authority which, when he wrote, would seem to have been claimed for Mr. Mill; though to some it may seem, that the inexorable tribunal of time has already done much to diminish the necessity of reproducing it. 'For my part,' writes the Professor, 'I will no longer consent to live silently under the incubus of bad logic and bad philosophy which Mill's works have laid upon us. On almost every subject of social importance—religion, morals, political philosophy, political economy, metaphysics, logic,—he has expressed unhesitating opinions, and his sayings are quoted by his admirers, as if they were the oracles of a perfectly wise and logical mind. . . . During the last ten years the conviction has gradually grown upon my mind that Mill's authority is doing immense injury to the cause of philosophy and good intellectual training in England. Nothing surely can do so much intellectual harm as a body of thoroughly illogical writings, which are forced upon students and teachers by the weight of Mill's reputation, and the hold which his school has obtained upon the universities.' Professor Jevons attributes this temporary popularity to 'the force of Mill's style and the persuasive power of his words.' Many would be tempted to doubt the truth of this eulogy. To the writer it seems that, while Mr. Mill's Work is clearly superficial, it is only superficially clear. A more probable explanation is to be found in the powerful, though secret, influence which the modern Gnostics exercise over our periodical literature; by the help of which they are enabled to secure a temporary reputation for any moderately gifted author, whose writings tend in any way towards the eventual subversion of those established principles of religion, morals, political and social order, on the ruins of which they confidently hope to build their new temple. Hence we see that, as soon as one of these short-lived favourites falls from his place in public estimation, some other is paraded to fill the vacant place; till he too shares the fate of his predecessor. He is soon forgotten; but, nevertheless, he does the work expected of him in his day. Anything rather than that the thought of the age should be allowed to revert to those solid principles, on which our Christian civilization is founded.

[1] *First Principles, Part* i, *ch.* 3, § 18, *p.* 58, *Fourth Edition.* The italics are not in the original.

Now let us summon another witness as to the objective truth of this idea,—a witness unknown neither to Mr. Mill nor to the generation of which he was a boast. Dr. Whewell expresses his mind upon the point in the two following passages: 'The assumption, in the reasoning, of certain centres of force acting at a distance, is to be considered as nothing more than a method of reducing to calculation that view of the constitution of bodies which supposes that they exert force at *every* point. It is a mathematical artifice of the same kind as the hypothetical division of a body into infinitesimal parts, in order to find its centre of gravity; and no more implies a physical reality than that hypothesis does[1].' So again: 'It may appear to some persons that the assumption of an intermedium between the object perceived and the sentient organ results from the principles of our mechanical reasonings,—that every change must have a cause, and that bodies can act upon each other only by contact. It cannot be denied that the principle does offer itself very naturally as the ground of our belief in the media of sensation. . . . But yet we cannot but ask, Does the principle, that matter produces its effect by contact only, manifestly apply here? When we so apply it, we include *sensation* among the *effects* which material contact produces,—a case so different from any merely mechanical effect, that the principle, so employed, appears to acquire a new signification. May we not, then, rather say that we have here a new axiom,—That sensation implies a material cause immediately acting on the organ,—than a new application of our former proposition,—That all mechanical change implies contact[2]?' It is observable, that in these two passages the learned Doctor describes the theory of centres of force acting at a distance as '*a mathematical artifice*,' which in nowise implies '*a physical reality*,' and speaks of the *principle* that '*bodies act upon each other only by contact*,' as one of those principles which '*form the basis of our mechanical reasoning*.' It is further to be remarked, that, in the Article from which the second passage has been extracted, he classes the idea of a medium among those necessary conceptual forms in our minds, which—in accordance with the philosophical theory of Kant—he deems to be the *à priori* and regulative ideas, that subordinate the facts (con-

[1] *Philosophy of the Inductive Sciences, B.* v, *ch.* 5, *a.* 10.
[2] *Ibidem, B.* iv, *ch.* 1, *a.* 3.

nected with the secondary mechanical sciences), obtained by experience. There is another passage[1], indeed, in which Dr. Whewell seems, clearly enough, to defend the theory of the action of bodies at a distance; and it is difficult, though not perhaps impossible, to reconcile the latter with the former. We are not here, however, concerned with this writer's consistency. It is enough for our purpose, that he should have spoken of the necessity of contact to the causal action of bodies, as a principle that forms the basis of our mechanical reasonings. Thus much suffices to show the inaccuracy of Mr. John Stuart Mill's peremptory assertions; and affords a ground for hoping, that even those, who are prejudiced in favour of the opposite hypothesis, will weigh with careful deliberation the demonstrations about to be submitted to them, in proof of the Scholastic teaching on this point.

Prolegomenon II.

It may be plainly seen from the Enunciation, that there is no question at present touching the possibility of one body acting upon another body at a distance, by means of an intervening medium.

Prolegomenon III.

It matters nothing to the problem in hand, whether we take the action of integral bodies on bodies, or of the physical elements of bodies on each other; or whether we conceive of the latter as atoms, molecules, or forces. The same laws that regulate the causal activity of bodies on each other, will likewise regulate that of their integrating parts, supposing these to be actual and not merely potential.

The Proposition is proved, first of all, by certain *à priori* arguments.

I. The first argument is derived from the essential proportion subsisting between the first and second act of any whatsoever entity. Let us here recall to memory, that the first act of an entity is its act of being. It denotes, therefore, the existence of the entity, fully constituted in its specific nature, outside of its causes. The second act of an entity is its natural operation. Now, the second act is not only essentially dependent on the first; but it is concomitant with, and proportioned to, this latter. It is

[1] *Philosophy of the Inductive Sciences, B.* iii, *ch.* 9, *a.* 8.

dependent on the first act, for the obvious reason that nothing can act that is not itself existing; according to the ancient saying, that a thing must *be* before it can *act*. Further: Because the specific form of the agent is the principal formal principiant of operation; the second act is dependent on the essential nature of the agent. Again: The second act depends upon the first act for its individuation; for actions are of supposits,—that is to say, are the accidents of complete and individual substances. Thus, for instance, we speak of the acts of Brutus and Cassius; and our room is lighted by this particular lamp. In the next place, the second act is concomitant of the first. For as long as the agent exists, for so long is its natural operation possible; as soon as the agent ceases to exist both in itself and in its instrument, its operation ceases to be possible. In the last place, the second act is proportioned to the first; because the second act primarily proceeds from the form which determines the first act. Since, then, the existence, or first act, of the agent is essentially presupposed as necessary to the second act, and the latter is essentially concomitant with, dependent on, and proportioned to, the former; operation postulates the presence, *in some way or other*, of the agent. This conclusion is strongly confirmed by the fact, that an act of natural operation is an accident of the agent, and forms no part of its essence. Hence, as an accident, it is naturally inseparable from its Subject. But, if it inhere in the Subject; it must obviously be present with the Subject, and the Subject with it. It follows that, wherever the Subject is not present, there the operation is impossible. Once more: Since the second act is proportioned to the first; the limitation of the specific nature will determine the limitation of the operation. These preliminary positions acquire yet greater force, when we analyze more deeply the concepts of the first and second act. Both are essentially referred to one and the same essence; but the second is necessarily dependent on the first, not only because it is posterior in order of nature, but also because it is accidental complement of the first. It follows, that the second act of natural operation is as truly an act of the specific nature as the first act of existence, and is equally inseparable from it. It can, therefore, no more be distant from the supposit of such essence, than the existent constitution of the same. To put it otherwise: The supposit of a substantial entity can no more be distant from its natural operation,

than it can be distant from its own existence. In all *immediate* operation, then, it is of all necessity that the agent should be *suppositively*—that is to say, in its perfect individual substantiality—present to its second act.

Thus much premised, let us now betake ourselves to an immediate solution of the problem. It affords no slight presumption in favour of the position maintained in the Enunciation, that in *immanent* action the point is not open to doubt. There must be *de potentia absoluta* the most intimate presence of the agent with its Subject, because the two are physically identical. But the fact of immanence cannot introduce an essential distinction into the various acts of natural operation. It may, however, be plausibly urged, that the fact of an action being immanent does introduce an essential distinction. For in transient action, (which is the exclusive subject of the present controversy), the whole operation from first to last is in the recipient of the causality. The effect is in the Subject, and is only attributed to the Efficient Cause by an extrinsic denomination. To explain: The effect in its entirety belongs entitatively to the Subject in which it is produced; but, formally considered as an effect, it connotes extrinsically some entity as its Efficient Cause. Thus, for instance, the heat in hot water belongs exclusively to the water in which it is produced; but, considered as an effect, it denominates the fire as its agent by an extrinsic denomination. It is here necessary to introduce a caution against a vulgar error. We must not suppose that, in these and similar instances of immediate operation, there is any real passage or transfer of some entity from the agent to the Subject of its action. The heat does not physically pass from the fire to the water; so that the form of heat now in the water can be said to have once belonged to the fire or, in any but an analogical sense, to have been *communicated* to the water. There may, indeed, have been an expenditure of force in the exercise itself of the causal action; but this is quite another thing. As to the effect, it is a new entity generated in the Subject, not something pre-existing and transferred. Assuming the peripatetic teaching on this head to be true, the gravity of the difficulty is augmented. To continue the same illustration: The fire makes the water by its causal action first lukewarm, then warm, then hot, then scalding; but the lukewarmness, warmth, heat, scalding energy are not, as effects, in the fire, but new accidental forms

in the water. The generated motion from first to last is *outside* the agent, *in* the Subject. So that, after all, it would seem to be a property of transient action, that the operation should be separated from the entity of the agent. In such case, where would be the difficulty of admitting that an Efficient Cause could act on its Subject, even should a vacuum intervene? This argument applies equally, as may be seen, to spiritual as to material agents.

In order at once to meet this difficulty, and to evolve the first *à priori* argument in favour of the present Proposition; it becomes us to make a yet stricter examination into the nature and essential constitutives of transient action. Wherefore,

i. Though the whole transient action, as a passive effect—that is to say, as something acquired—is in the Subject; as an action, it is the act of the agent. Thus it belongs, (though in different ways), wholly to the Subject and wholly to the agent;—to the former entitatively, to the latter productively. Though it is true, that the effect, or entity produced, is really in the Subject and not in the agent, and that, consequently, the effect *as* a physical entity only connotes the agent by an extrinsic denomination; it is, nevertheless, equally true, that this extrinsic denomination is the result of a real transcendental relation, and covers a fundamental reality. If it were not so; the Category of Action would be a purely conceptual, not a real classification. Moreover, in such case all inanimate things would be deprived of anything like real activity; since they are destitute of all immanent action. Further: Immanent actions and transient actions would each postulate a separate Category; since the former would be second acts of their principiant, which the latter would not be. Lastly: It contradicts the common sense and common judgment of mankind, that there should be no real connection between the effect produced and the causality of the agent. It follows, that the effect as really appertains to the Efficient Cause in one way, as it really appertains to the Subject in another.

ii. It is obvious to common sense, that the words, *produce, cause, evolve,* denote as intimate a connection with the Efficient Cause; as the words, *produced, caused, evolved,* denote an intimate connection with the Subject. In a word, the causality of the agent is something real; and denotes a real dependence of the effect on the action of the Efficient Cause.

iii. Therefore, though not on the part of the passive effect, as a new entity in the Subject, yet on the part of the effect as actively produced, such effect enters into the second act of the specific form of the agent. Therefore, as an act, it is an accident of the Efficient Cause; no less than, as an effect, the same entity is an accident of the Subject.

iv. Hence it follows, that, in transient as in immanent action, the substantial presence of the agent with the Subject of its causal action is required; for the effect is at once the accident of both.

It now remains to reduce the argument to something like logical form.

Every effect essentially postulates the substantial presence of its Efficient Cause with the Subject in which the effect is produced. But, in the hypothesis of the intervention of a vacuum between the cause and the Subject, the substantial presence of the cause with the Subject is rendered impossible. Therefore, etc. The *Major* is thus declared. The effect, as actively effected, is an act of the Efficient Cause and, consequently, an accident informing the faculty of the agent; the same effect, as passively received, is an accident informing the Subject. Therefore, the effect is wholly an accident of the cause and an accident of the Subject. But this would be impossible, unless the Efficient Cause and Subject were substantially together in some way or other; because, if the two were separate, the effect must necessarily cease to be the accident either of the cause or of the Subject, since no accident can be naturally separated from the substance which it informs. The *Minor* at first sight may seem evident; nevertheless, to preclude the possibility of evasion, it is thus declared. If a vacuum should be interposed between the agent and Subject, this supposes distance between the two; consequently, they cannot be together. It has been objected that, though not *suppositively* present, the Efficient Cause may, notwithstanding, be virtually present with the Subject of its causality, in the course of producing the effect. But such an explanation, if it means anything at all, supposes that some virtue or power of the cause is present with the Subject. Now, this is conceivable, only in one of two ways. Either this virtue passes continuously through the vacuum from the agent to the Subject; or the virtue becomes isolated from the agent, and immediately present to the Subject. The former hypothesis is self-destructive; since there would be no longer any

vacuum; but a continuous communication, through the intervention of the power between cause and Subject. In the second hypothesis, the virtue is either an accident of the agent or itself a substance: If an accident of the agent, we are involved in the manifest contradiction of an accident, naturally existing in a state of separation from the substance to which it belongs. If it is itself a substance, it becomes the proximate cause; and there is suppositive conjunction between Efficient Cause and Subject, without any intervening vacuum. However, it will be seen more clearly in the next argument, how completely this hypothesis of a virtual presence is opposed to metaphysical truth.

Note. It has doubtless been remarked by the reader, that the above argument is equally valid in respect of spiritual, as of bodily agency; if we look to the fundamental principle on which it is based. Hence, the Angelic Doctor assumes this truth, as affording a demonstrative argument in proof of the Divine Omnipresence[1]. The demonstration that follows next may be considered as a confirmation of the first; but more directly embraces bodily agency, and the nature of the presence of a bodily agent with the body which is Subject of its causal action.

II. As the first argument is derived from the nature of the second act of substance in general; so the present is founded on the essential imperfection of the second act of bodily substance in particular. In pursuance of the method already adopted, an analysis will be first instituted touching the nature of bodily causality; and afterwards the argument will be drawn out in form.

Let us enter upon the analysis, with St. Thomas as our guide. 'Now, to act,' writes the Angelic Doctor, 'which is nothing else than to make something to be in act, is the absolute property of act, *as* act. Hence, every agent causes that which is like itself. Thus, then, it is owing to the reason of an entity being a form not determined by matter to quantity, that it is an indeterminate and universal agent; while it is due to the reason of its being determined to *this* matter, that it is an agent limited and particular. Hence, if the form of fire were separate from matter, as the Platonists maintained; it would be, in a way, the cause of all ignition.

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[1] 'Deus dicitur esse in re aliqua dupliciter: Uno modo per modum causae agentis, et sic est in omnibus rebus creatis ab ipso.' 1ª° viii, 3, *c.*

But *this* form of fire, which is in *this* bodily matter, is the cause of *this* ignition which is from *this* body to *that*. Hence it is, that such action is effected by means of the contact of two bodies[1].' These observations of the Angelic Doctor shall receive an explanatory paraphrase. To act is the property of an act, as such; which is shown by the fact, that a cause produces an act like itself,—like in the specific nature, which is the act. Now, to cause is to reduce the Subject of causality to act of some sort. Therefore, the cause, reduplicatively *as* cause, must be act *as* such. Hence it further follows, that the substantial form will be the principal cause, while the accidental form will be only instrumental cause; because the former is simply act, while the latter is act in a certain respect. Thus it is, that the substantial form is the principal formal principiant of causal action. Now, should the substantial form of some body be separated from the matter and existing of itself, it would not be determined to place; consequently, neither would its natural operation be determined to place. If this were so; its operation would be unlimited. The material form would be capable of acting here, there, and anywhere; because itself has no *here*. Wherefore, if (as the Platonists supposed) there were an ideal fire, prototype of all bodily fire; it would be a sufficient cause of all ignition in a certain way,—that is to say, inasmuch as it would not be determined to any particular place. It could anywhere set a light to anything capable of being ignited. But, in the order of nature, a material form is essentially the act of a certain determinate portion of extended matter, or of matter subject to quantity. Hence, it exists as act, exclusively within the periphery of that determinately extended matter which it informs. If, then, it only causes as act, and as act exists only within the limits of the extended matter; it follows, that its causal operation cannot exist beyond the same limits. Therefore, it is necessary to the causal action of one body on another, that the two should be in mutual contact. Why

[1] 'Agere autem, quod nihil est aliud quam facere aliquid actu, est per se proprium actus, inquantum est actus. Unde et omne agens agit sibi simile. Sic ergo ex eo quod aliquid est forma non determinata per materiam quantitati subjectam, habet quod sit agens indeterminatum et universale; ex hoc vero quod est determinata ad hanc materiam, habet quod sit agens contractum et particulare. Unde si esset forma ignis separata, ut Platonici posuerunt, esset aliquo modo causa omnis ignitionis. Sed haec forma ignis quae est in hac materia corporali, est causa hujus ignitionis quae est ab hoc corpore in hoc corpus; unde et fit talis actio per contactum duorum corporum.' Iᵃᵉ cxv, 1, *c*.

so? The reason is plainly to be seen in the nature of contact. Bodily contact, says St. Thomas,—following in the footsteps of the Philosopher,—'is nothing else but the conjunction of the limits of two quantities[1].' It has been already seen, that a material form can only operate within the limits of the extended matter,—that is to say, within its quantitative limits. Now, if two bodies are in contact, where the contact exists, the limits of the one are identified with the limits of the other; so that the form of the acting body, in operating to its own limit, *ipso facto* operates on the limits of the Subject-body in contact with it.

For the sake of greater clearness, the teaching of St. Thomas, as just paraphrased, shall be reduced under certain headings:

i. Since matter is purely passive; of itself it is incapable of operation.

ii. If, then, bodies have a natural operation of their own, (about which there can be no reasonable doubt), the principiant of their operation must be the substantial form; because there are no other essential constituents of bodies than these two.

iii. All action and operation are the property of forms.

iv. Forms are capable of transient action; because, being acts themselves, they are capable of reducing another entity to act.

v. Hence it follows, that forms can exercise causal action, proportioned to the nature and limits which are proper to them as specific acts.

vi. Since separate forms, which are subsistent in themselves and independent of matter, are not limited to a determined place; their sphere of action is likewise locally unlimited.

vii. Material forms, as being acts of matter, are limited to the body which they actuate; so that they neither are, nor can be, beyond the quantitative limits of this latter.

viii. Since forms can only operate as being acts, these material forms can only act causally on another, up to the quantitative limits of the bodies they inform; for, outside such limits, they are no longer acts and, having no independent subsistence, are non-entities.

ix. It follows, that one body can act upon another, only on condition of mutual contact; because, by physical contact, the

[1] 'Omnis actio corporalis requirit contactum; tactus autem corporalium consequitur quantitatem; quia nihil aliud est quam conjunctio terminorum duarum quantitatum.' 4 *d.* x, *a.* 4, *q.* 1, *c.*

quantitative limits of the two bodies are one, at the point or points of contact.

x. The same principles apply to the proximate instrumental principiant, which is some accidental form inhering in the body. The question of external instruments does not concern us here, because we are exclusively considering the immediate action of body on body; though obviously the same holds good of them likewise, in so far as they are material.

xi. Consequently, the action of the accidental form, (which is the proximate instrumental principiant), like its entity, is limited to the quantitative periphery of the substance that it informs.

xii. Therefore, it too must be in contact with the body in which it helps to produce the effect.

xiii. Finally: It may be added, as a patent corollary from the teaching of the Angelic Doctor, that, in the event of a bodily substantial form concurring immediately, with an external instrument, towards the production of an intended effect on some body divided from it by the said external instrument; the said form must temporarily and accidentally actuate the instrumental cause, so as to admit of quantitative contact with the Subject of its operation. This evidently presupposes the contact of the two causes.

The argument, implicitly contained in the above summary, may be thus expressed: No purely material form can operate outside of the quantitative limits of the body that it actuates. But every material form that operates upon a body separated from its own by a vacuum, operates outside of the quantitative limits of the body that it actuates. Therefore, no purely material form can operate upon a body separated from that of which it is the form by a vacuum.

Declaration of the Major. A form can operate on another entity, only in so far as it is act. The reason is, that nothing can reduce another to act, unless it is itself act; because nothing can give that which it does not itself possess. But a purely material form, outside of the quantitative limits of the body that it actuates, is nothing; because, for all that it is, it is exclusively act of *this* determinate body. Therefore, it cannot operate, outside of *these* quantitative limits.

III. Another argument is based on the nature of bodily action. Every act of body upon body partakes of the nature of motion. Of these actions the primary and, as it were, typical is the

locomotive. There are besides, compression and dilatation, as produced in bodies, which are motions in quantity; alterations, which are motions in quality; and generations, which are motions in substance. Those latter are immediately and instrumentally caused by alterations; so that, for the purposes of the present argument, they may be included under qualitative motions. As before, the teaching of the Angelic Doctor shall lead the way towards an evolution of the premisses, from which to draw the required conclusion. 'Action,' writes St. Thomas, 'considered as a Category, expresses something that flows from the agent, and with motion[1].' This motion is the effect *in fieri*, caused in the Subject. Accordingly, St. Thomas remarks that 'Action, as one of the last six Categories, signifies a relation in motion to the agent. Hence, that which takes place mediately between agent and Subject,—that is to say, motion,—in relation to the agent, is called Action; while, in relation to the Subject, it is called Passion[2],' (receiving). It is plain, then, that agent and Subject are united by an intermediary motion which is common to both, though in a distinct order. This is clearly expressed by St. Thomas in the following words: 'One that causes movement, and is a natural agent, moves and acts by an intermediary action or motion, which intercedes between that which imparts and that which receives motion,—between agent and Subject. Hence, the agent and the Subject, that which imparts and that which receives motion, must necessarily come together, at least in this intermediary. . . . Wherefore, there is a mutual real ordering of the one to the other; more particularly, seeing that the intermediary action is a certain perfection proper to the agent[3].' Yet, forasmuch as the intermediary motion is related to agent and to Subject according to a distinct order, 'Action,'—to borrow the words of St. Thomas,—'for the reason that it is

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[1] 'Actio, secundum quod est praedicamentum, dicit aliquid fluens ab agente et cum motu.' 1 *d.* viii, *Q.* 4, *a.* 3, 3[m].

[2] 'Actio enim, prout est unum de sex principiis, dicit respectum in motu ad agens: unde illud quod fit inter agens et patiens, scilicet motus, respectu agentis dicitur actio; respectu vero patientis dicitur passio.' *Opusc.* xlviii (*al.* xliv), *c. unic. de sex praedicam., fi.*

[3] 'Movens et agens naturale movet et agit actione vel motu medio, qui est inter movens et motum, agens et passum. Unde oportet quod saltem in hoc medio conveniant agens et patiens, movens et motum. . . . Unde utriusque est realis ordo unius ad alterum, et praecipue cum ipsa actio media sit quaedam perfectio propria agentis.' *Po[a]. Q.* vii, *a.* 10, 1[m].

action, is considered as being *from* the agent; but, inasmuch as it is an accident, it is considered as being *in* the agent as Subject[1].' It is of some little moment to consider with particular attention this last statement of St. Thomas. That reality which is called *action* is included under three Categories. According to its formal signification, by which the effect in the Subject denotes the Efficient Cause, by an extrinsic denomination, as that on which it depends; it is in its own Category of Action. Considered as connoting a consequent relation between cause and effect, or Subject and effect; it is included under the Category of Relation. Considered as an accidental perfection really inherent in agent as well as in Subject; it belongs to the Category of Quality. St. Thomas teaches, then, that as the motion is a perfection inhering in the Subject; so, in like manner, it is a perfection really inhering in the agent. Accordingly, in another place he states the same truth in the following yet clearer terms: 'Action, according to its formal meaning, does not express its being *in* the agent, but *from* the agent. Nevertheless, *it is evident that action is in the agent*[2].' It follows, that—to quote again the words of St. Thomas—'action, passion, and motion are one and the same thing[3].' Yet there is a marked difference in their connotation. For though action materially denotes motion, and passion materially denotes motion; yet action formally connotes the Efficient Cause, while passion formally connotes the Subject. Hence, they respectively connote two opposite terms,—in our present inquiry, the body acting and the body acted upon. But motion formally denotes the effect *in fieri* only; materially, however, it connotes its two terms. In this way it connotes the commencement of action from the Efficient Cause as its *terminus a quo*, and the effect received in the Subject as its *terminus ad quem*. But these are evidently two *quasi* realities which, as accidents, are, the one in the agent and the other in the Subject. For these reasons St. Thomas makes the following statement, which at first sight might seem to be at variance with what he teaches in the preceding extracts; but is really in harmony with

[1] 'Sicut et actio ex hoc quod est actio, consideratur ut ab agente; inquantum vero est accidens, consideratur ut in subjecto agente.' *Po*ª. *Q.* vii, *a.* 9, 7ᵐ.

[2] 'Etiam actio non significatur ut in agente, sed ut ab agente; et tamen constat actionem esse in agente.' *Po*ª. *Q.* viii, *a.* 2, *c.*, *fi.*

[3] 'Notandum, quod ut habetur 3 Physicorum, actio et passio et motus sunt una et eadem res.' *Opusc.* xlviii (*al.* xliv), *c.*, *De Acti.*, *v. m.*

it, according to the explanation just given. 'Since Action,' he writes, 'is in the agent and Passion in the Subject; that which is action and that which is passion cannot be numerically the same accident; since one and the same accident cannot exist in different Subjects. . . . But, forasmuch as the difference between them exists only in the terms,—that is to say, the agent and Subject,—and motion makes abstraction of both terms; consequently, motion is considered as without such difference. For this reason it is said, that the motion is one and the same[1].' Action, therefore, and passion are materially one and the same motion; but, in the former, the motion is considered as a reality attaching to the agent, in the latter, as a reality attaching to the Subject. But these can no more be one and the same reality, than the two points which respectively represent the *terminus a quo* and the *terminus ad quem* of a line. That this is his true mind in this passage, is clearly seen from the context. He is answering a proposed difficulty touching relations; to the effect that relations are not real accidents, since they can be separated from their Subject without any change in the latter. St. Thomas replies, that there are two things in a relation. There is the formal relation, which exclusively consists in an order between the relative and its correlative; and there is the foundation, which is a form inherent in the relative or in the correlative as in its Subject. The formal relation, or simple order of the one term to the other, may be removed without any real change in the Subject, provided that the accidental form, which is the foundation, remains; but, if this latter should be subtracted, the Subject (whether relative or correlative) would be really altered. In the one case, the accidental form ceases from its transient action, but remains in the Subject as potential cause of such action; in the other case, it no longer exists. The former St. Thomas illustrates by the heat, let us say, in fire. 'If the material for heating is withdrawn,' he writes, 'the action of heating ceases; but the Efficient Cause of heating remains[1].'

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[1] 'Cum actio sit in agente, et passio in patiente, non potest esse idem numero accidens quod est actio, et quod est passio, cum unum accidens non possit esse in diversis subjectis. . . . Sed quia eorum differentia non est nisi penes terminos, scilicet agens et patiens, et motus abstrahit ab utroque termino; ideo motus significatur ut sine ista differentia; et propter hoc dicitur, quod motus est unus.' 2 *d.* xl, *a.* 4, 1^{m}.

[2] 'Sicut et subtracta materia, tollitur calefactio, licet maneat calefactionis causa.' *Po^{s}.* vii, *a.* 9, 7^{m}.

We will now, as before, reduce the teaching of the Angelic Doctor under certain headings:

i. The action of bodies on each other is a motion, proceeding *from* the Efficient Cause, but begun and completed *in* the Subject. Hence, the effect is called action by an extrinsic denomination; since it connotes an extrinsic agent, as operating cause.

ii. In reality the motion, the action of the agent, and the passion in the Subject, are all one and the same thing.

iii. Action and Reception are, nevertheless, really distinguished from motion by a connotative addition; for action essentially connotes the agent, and passion as essentially connotes the Subject. But it is plain, that both agent and Subject are entities really distinct from the motion. For the like reason, action and passion, as something real in agent and Subject respectively,—that is to say, as real forms inherent in each,—are distinct with a real mutual distinction. Yet action and passion, apart from their extrinsic denomination, (which is derived from a reality), are really nothing but the motion, or the effect *in fieri.*

iv. Motion, therefore, is an intermediate between agent and Subject, but formally including neither.

v. By the medium of the motion, agent and Subject are united together; because they meet in one and the same motion.

vi. The motion is truly affirmed to be *in* the agent as an accident, no less than *from* the agent as the *terminus a quo;* because the accidental form, from which the action proceeds and by which it is initiated, is inherent in the agent.

vii. The *terminus a quo* of the transient action, *as transient*, is the body which is the Efficient Cause; and the *terminus ad quem*, under the same respect, is the body that is Subject of the causal action.

viii. The *terminus a quo* of the transient action, *as action*, is the accidental form in the agent as proximately disposed for producing the effect; the *terminus ad quem* is the completed effect.

ix. The motion is the effect *in fieri.*

x. In bodily motion there are two principal conditions or, rather, elements,—to wit continuity and succession. The former is measured by place; the latter, by time.

This summary premised, the argument, based on this teaching of St. Thomas, may be thus formally stated: In order that one body may be able to act immediately upon another, the following

conditions are absolutely necessary: (*a*) The motion, initiated by the agent as the *terminus a quo* and received in the Subject as the *terminus ad quem*, must be one and the same continuous motion; (*b*) The agent and Subject must be united, by meeting together in one and the same continuous motion; (*c*) The action, passion, motion, must be *entitatively* one and the same; (*d*) The term in the agent, whence proceeds the motion, must be united with the effect by means of the same continuous motion[1]. But the verification of each one of these four conditions is rendered absolutely impossible, in the hypothesis of a vacuum intervening between the body that imparts, and the body that receives motion. Therefore, it is impossible that one body should be able to act immediately upon another; if there should be a vacuum between them. The *Major* is a mere repetition of the teaching of St. Thomas. The *Minor* is declared, member by member, as follows:

1. *If a vacuum should intervene between the agent and the Subject; it would be impossible that the motion, initiated by the agent as the* terminus a quo *and received in the Subject as the* terminus ad quem, *should be one and the same continuous motion.* In the hypothesis of an intervening vacuum, the supposit, or complete individual substance, of the agent is separated by the *distance* of the vacuum (for it is impossible to suppose a vacuum that is not, in some way or other, dimensive) from the supposit of the Subject. Either, then, there are two discontinuous motions, or the agent is not the *terminus a quo* of the motion; for either a motion proceeds immediately from the agent or Efficient Cause, is arrested by the vacuum, and is renewed at the quantitative limits of the Subject, or the motion is initiated at and in the Subject. Neither can it with any show of reason be maintained, that the bodily agent is *substantially* present at the distant place; yet is *immediately* present with the Subject, by virtue of the effect produced. For this is possible, only in one of two ways. Either there is a bilocation of the agent; or the agent is virtually present with the Subject in the production of the

[1] 'In motu proprie accepto est duo reperire, scilicet continuitatem et successionem: et secundum quod habet continuitatem, sic proprie mensuratur per locum, quia ex continuitate magnitudinis est continuatus motus, (ut dicitur 4. Phys.): secundum autem quod habet successionem, sic proprie mensuratur per tempus; unde tempus dicitur numerus motus secundum prius et posterius.' 1 *d.* viii, *Q.* 3, *a.* 3, *c.*

effect. The former, as all will agree, is naturally impossible; we are driven, in consequence, to the latter hypothesis. But what precisely is meant by the agent being *virtually* present? Is it simply meant that, though the agent is not present, it is able to produce an effect upon the distant Subject? But this is a manifest begging of the question. If this meaning is excluded; the term seems capable of explanation in only two ways. Either a power—a force, if you will—passes from the agent to the Subject by continuous motion; or this force, locally separated from, and locally independent of, the agent to which it belongs, produces the motion immediately in the Subject of its own right. In the former case, not only is the hypothesis destroyed by an invasion of the vacuum, (as was shown in the first argument of the present Proposition), but the substantial form of a body is supposed to act outside of its quantitative limits; which, in the previous argument, has been proved to be impossible. Assuming the latter supposition; the agent would no longer be the starting-point of the motion, but an independent force, separated from its Subject. Moreover, there would be no vacuum between the proximate Efficient Cause and the body on which it acts. One other hypothesis might be conceived; though it almost perishes in its expression. It might be said, that this force is an adventitious quality, making use of the body as its *point de départ*. But such force must be either a substance or an accident. If the former, it needs no centre, and the action on the Subject is immediate and indistant: If the latter, whose accident is it; since it does not belong to the putative agent? and how does it come to be separated from its Subject of inhesion? In any case, as an accident, it is acting beyond the material limits of its being.

2. *If a vacuum should intervene between the bodily agent and the bodily Subject; it would be impossible that agent and Subject should be united, by meeting in one and the same continuous motion.* If the agent and the Subject meet together in one motion equally belonging to each, there must be mutual presence,—a presence proportioned to their nature. Such presence, therefore, cannot be intentional or sensile; because the former belongs to the will, the latter to the faculties of sense, and we are at present exclusively considering the interaction either of inanimate bodies, or (which amounts to the same thing) of animate bodies as causal

of purely bodily motion. There remains, therefore, nothing but local presence; and, since interpenetration is out of the question, it must be a presence by local contiguity, or mutual contact. But, in the hypothesis that there were a vacuum between agent and Subject, there could be no possible contact between the two; so that they could not meet in one motion common to both.

3. *If a vacuum should intervene between the bodily agent and the bodily Subject; it would be impossible that the action, passion, motion, should be entitatively one and the same.* Motion essentially connotes its two limits,—its starting-point and its point of rest. In the case of the transient action of one body on another; the starting-point is in the agent, and the point of rest is in the Subject, or body that receives the action. Now,—to repeat what has been already stated,—action denotes the motion, as a whole, in its relation to the Efficient Cause from which it proceeds; while passion denotes the same entire motion in its relation to the Subject in which it is received. It is thus that action, passion, motion, are entitatively one and the same: Therefore, the action must be where the passion is and, in like manner, where the motion is; and *vice versa*. But, if the action must be where the passion and motion are, obviously the agent must be where the Subject is; since the passion and motion are in the Subject. This, however, would be impossible; if there were a vacuum interposed between the agent and the Subject. Since the motion is continuous and includes its two limits, the agent, locally separated from the effect, could not be the starting-point of the motion; and the action, which essentially connotes the agent, would be separated, by the vacuum, from the motion which is in the Subject. How could action be wholly *in* the agent, as St. Thomas affirms it to be, and the passion wholly *in* the Subject, and both be one and the same motion; if the agent is a body in one place, and the Subject a body in another place physically separated from the former by a vacuum? The motion, *as* action, would be distant from the Subject; the same motion, *as* passion, would be distant from the agent. How, then, can the action, passion, and motion be entitatively one; unless it be admitted that a thing can be distant from itself?

4. *If a vacuum should intervene between the agent-body and the Subject-body; the term or accidental form, whence as from its proximate cause the action proceeds, could not be united to the completed*

effect, which is the other term of causal action, by the medium of the same continuous motion. For in causal action, which is transient, —as, indeed, in the instance of all finite action,—the substantial form is not the proximate Efficient Cause; but acts through the subordinate causality of some accidental form, which is the proximate cause. Thus, fire warms the water by its quality of heat, which is a quality inherent in itself; and this heat evolves a heat like to itself out of the potentiality of the water. The progress from lukewarmness to the ultimate degree of heat that the water is capable of receiving, represents the motion generated in the water. If, then, the fire were separated from the water by a vacuum; the heat of the fire would be also separated from the water, because it is an accident inherent in the fire. Thus, the starting-point of the causal motion would be locally separated from the motion itself and, as a consequence, from the completed effect. Since the motion is continuous, it could not begin in isolation from itself; so that the said starting-point would be no starting-point at all, and the motion would be without beginning.

IV. The fourth and last *à priori* argument is based on the necessity of an Efficient Cause being determined to its causal action by the particular Subject, as a necessary condition of its act; and on the impossibility that such determination should exist, if one body were separated from every other by a vacuum. Let us commence with one or two illustrations. The first shall be taken from chemistry; and it shall be given, under protest, in the terms which have been generally adopted by modern chemists. Let us take a piece of the metal-element, potassium, and drop it into water. A chemical change by displacement takes place. A flame appears, accompanied by a slight explosion; and the application of a chemical test assures us that potash, or potassic hydrate, is present in the water. The following symbol accounts for the phenomenon: $2\,H_2O + K_2 = 2\,KHO + H_2$. Let us now read this symbol in the modern language of chemistry. Two molecules of water are supposed to be brought *in presence* of two atoms of potassium; in other words, two atoms of oxygen, in combination with four atoms of hydrogen, are supposed to be brought into presence of two atoms of potassium. Each atom of this latter displaces (as it is said) an atom of hydrogen; and, by the fact, finds itself in combination with the remaining atom

of hydrogen and the atom of oxygen belonging to each primitive molecule of water. The result is two molecules of potassic hydrate (K H O). The two atoms of hydrogen displaced are thus set free; and, on account of the heat resulting from the chemical change, take fire, causing the flame and explosive noise observable in the experiment. Now, let us examine this phenomenon. The two so-called atoms of potassium are in presence of four atoms of hydrogen, contained in the two molecules of water. They displace two of the atoms of hydrogen; and enter into combination with the remaining two, and with the two of oxygen, as the result of displacement. Why did they take the place of those particular two atoms, and not rather of the two that are freed? Further: It is quite allowed us to suppose, for the sake of illustration, that only two atoms of potassium have been used in the experiment. These are plunged into a vessel of water, containing thousands upon thousands of molecules of water,—each one containing in combination its two molecules of hydrogen. Why are the two particular molecules chosen by the two atoms of potassium, rather than any two others of the hardly calculable multitude that surround them? The answer would be easy and obvious enough, if one were permitted to suppose, that the two atoms of potassium had come into immediate contact with the two molecules of water selected, and that these formed each a continuous whole; for the fact of contact would be a sufficient reason for the determination. But now let us assume, that each atom of potassium is separated by a vacuum from every other atom, and from all the molecules of water present in the vessel; what sufficient reason can be offered for the determination? Can it be said that comparative nearness is a sufficient reason? Such a solution cannot stand, for two reasons:

a. The one is, that the distance is equal in all cases; no matter what the vacuum may be. As vacuum, it is immeasurable and indefinite. Distance is the measure of extended space between two or more bodies; but in a vacuum there is no extension and, consequently, no distance. Isolation there may be. Dimension presupposes quantity and figure; in a vacuum there is neither, and, consequently, no capacity for measure. Against this declaration it may be urged that, though the vacuum could not have intrinsic limits, for the reasons alleged, yet that it is capable of extrinsic limitation, by means of the quantitative or

other limits of the bodies that surround it; and that it can, in consequence, be defined and mensurable. The reply to this arrest of judgment is twofold. In the first place, according to the dynamic theory, there could be no such limits; since mathematical points—however thick their cluster—cannot constitute a physical limit; and, according to the modern atomic theory, there could be no limit, because each atom and each molecule are supposed to be surrounded by a vacuum, so that these could not give to the vacuum a figure that may determine it. Islands do not determine the measure of the sea, or limit its extent. This last illustration, however, suggests another objection to the position here maintained. It may be said: True it is, that the islands do not set limits to the ocean; yet the distance between island and island may be measured. Similarly, the centres of forces or the atoms are unable to set limits to the vacuum; yet the distance from point to point, or from molecule to molecule, may be capable of measurement. The objection cannot be admitted; because the supposed distance between the two is a vacuum, and in a vacuum there is no distance, no measure. But surely a line could be drawn from point to point, which would be measure of the distance. Certainly this would not be possible physically; because no line could be drawn, where there is no extension. It seems more probable that it cannot be done, even mathematically; because, if the vacuum is conceived as the straight line between the two points, it is ideally destroyed by the act of measurement. To determine distance, you suppose length; but length is impossible without quantity. That we are landed in a metaphysical contradiction,—viz. that distance should be indistance,—cannot be laid to the charge of the Scholastic doctrine; let those look to it, who maintain the possibility of a vacuum.

b. The other reason why the solution originally proposed cannot stand, is this. We will suppose, for the sake of argument, that the said vacuum is definite and mensurable; and that, consequently, it is capable of becoming a measure of distance and nearness. The solution offered would, even then, be nerveless and incompetent to reach the difficulty. For the hypothesis of a vacuum necessarily excludes all possibility of progressive action from term to term; otherwise, the vacuum would cease to be. The causal action, therefore, commences in immediate connection with the Subject; beginning, where the vacuum ends. Where-

fore, the supposed length or breadth or height or depth of the vacuum would be as irrespective of the causal action, as though it did not exist. The force cannot travel from agent to Subject; but is, where it immediately acts. It is, therefore, wholly indifferent to the causal action; whether the vacuum (even if mensurable) be measured by the quintillionth part of a millimetre or by billions upon billions of miles. To adopt a fresh illustration: In the hypothesis of a vacuum between body and body, there is no more reason why the fire should act upon the kettle of water that has been placed upon it, than on water in Saturn; if there be such a substance in this distant planet. A reply to the above argument has been attempted, in this wise: Though the activity of the force is only reduced to causal action by meeting with some Subject of its energy, and consequently the causal action commences only in presence of a fitting Subject; nevertheless, this force has a sphere of its own, radiating in all directions from its centre of indifference, and reduced to act as soon as it encounters the first fitting Subject. Consequently, its causal action (even supposing its sphere of energy to be, in a sense, infinite) would not be indifferent to distance and nearness. The answer is plain. This sphere of force is either something or nothing. If nothing; distance or nearness will not serve its turn. It is a mere mathematical artifice. If it be something; it must, from the nature of the case, be material. For inanimate matter has no spiritual properties. But, if it is material, and extends from its central point to the Subject of its causal action; there is no vacuum.

To reduce this argumentative analysis to logical form: In order that one body may be proximately capable of acting upon another particular body; it is necessary that the former should be previously determined to the latter, as Subject of its action,—in other words, that there should be a sufficient reason for its acting on *this*, in preference to *any other* body. But, in the hypothesis that there is a vacuum between agent and Subject, no sufficient reason can be alleged for the action of the former on the latter, rather than on any other body. Therefore, in the hypothesis of a vacuum between agent and Subject, one body would not be proximately capable of acting upon another body.

THE PROPOSITION IS PROVED, IN THE SECOND PLACE, BY CERTAIN *À POSTERIORI* DEMONSTRATIONS, WHICH ARE FOUNDED ON THE TESTIMONY OF COMMON SENSE, FACTS OF EXPERIENCE AND OBSERVATION, AS WELL AS ON THE EVIDENCE OF PHYSICAL LAWS.

I. Men universally, unless their minds have been pre-occupied with some adopted physical hypothesis, judge by a sort of natural instinct, that one body cannot act upon another, unless the two should be either immediately or mediately in mutual contact. If it were suggested to any ordinary person, that one body could act upon another at a distance, without any medium of communication between the two; he would certainly reject the statement with some expression of scorn. Whenever, as in the instance of a magnet attracting a needle, the agent and Subject of action are sensibly apart; the idea at once arises spontaneously in the mind, either that some real virtue passes through the intervening space from body to body, or that the air or some other medium acts as proximate instrumental cause. Should any one endeavour to persuade an ordinary body of listeners, that a telegram had been transmitted from New York to London by the simple working of the commutator or by manipulation in the telegraph-office, although the telegraph had been disconnected from the submarine cable; they would not give a moment's credence to the story, unless it should be made to appear, that the instruments of the two stations were connected by some other medium. What would a cripple think, if he were seriously told that there was not, and that there need not be, any actual contact between the crutches and his arm? Yet there is no philosophy, worthy of the name, that can afford to ignore, or make little count of, these instinctive judgments of mankind.

II. The experience of the senses confirms, in a very striking manner, the instinctive belief already signalized. For natural phenomena, if we trust exclusively to the testimony of the senses, all but unexceptionally force upon us the conclusion, that one body cannot act upon another, unless the two are in contact. According to Aristotle there are, in all, three sorts of motion produced by one body on another,—to wit, locomotion, alteration, increase or decrease of size. Each of these shall be submitted to a separate examination, in connection with the present contention; beginning with locomotion, as being the type of all motion.

i. There are four species of *imparted* locomotion, (with self-motion we are not now concerned), enumerated by the Philosopher,—viz. pulsion, traction, carriage, and turning or hoisting, (ἕλξις, ὦσις, ὄχησις, δίνησις). These four species are reducible to two; because *carriage* is motion *by accident*, and is, therefore, capable of reduction to motion *absolutely* such. Thus, for instance, if a man is carried along in a boat or on a horse; his motion is, as it were, accidental, and is really identified with the motion of that which is the vehicle. On the other hand, *turning round* or *twisting* is the union of the two motions of pulsion and traction; as can be plainly seen in the act of spinning a peg-top with the hands. Let us take *pulsion* first,—motion imparted by one body to another, in such sort that the former pushes or impels the latter from itself. If we throw a stone; we are conscious that the stone is in sensible contact with our hand, when first the motion is communicated to it. In like manner, we invariably perceive that one ball drives forward another ball on the billiard-table only when the one comes into seeming contact with the other. The ball that communicates the motion has itself received motion from the cue in contact. Eyes, ears, and hands, combine to answer us, that the said ball did not part with its inertia, till the point of the cue came into immediate contact with it. Unless the nursery-maid has her hand in sensible contact with the back; she could not push the perambulator before her.

If we turn to instances of *traction*,—or motion communicated to a body, by which it is drawn towards the agent,—the senses afford similar evidence. A man wishes to draw a book or a lamp towards him; unless he feels that he has his hand on the thing, he is convinced that he cannot do it. While in the act of moving it, he knows, (so far as his senses can teach him), that his hands and the particular object are in immediate contact. He both feels, and sees, and in certain cases may hear, that it is so. A bird carries off a feather to the nook which it has leased for the season; but, till it has seized the building-material in its bill, the feather will not follow it to the unfinished nest. Take an example of *carriage:* A person takes an airing in his brougham. His motion from place to place is no other than the motion of the vehicle. But how is it, that his motion and the motion of the vehicle are one? Only because, by sensible contact of various parts of his body, a physical continuity is

established. Let him disconnect anything that he has about him from all sensible contact with either himself or the vehicle, —as, by simply letting it drop from the window; it stays behind, while he is driven off. To pursue the example: The motion of the brougham is due to the traction of the horse. Let the immediate contiguity (so far as it is open to sensile perception) be in any way interrupted between the two,—put the traces, within the ten thousandth part of an inch of the trace-hook, on the shaft without attachment; the horse might as well be a hundred miles off. It may move; but not the carriage. Take, finally, an illustration which unites *propulsion*, *traction*, and *twisting:* It is to be found in the popular toy, called cup-and-ball. The ball is twisted by the fingers, propelled upwards by a jerk of the hand, drawn back by the string. Establish the smallest sensible space between the hand and the ball, between the string and the ball, or between the string and the handle of the cup: Would the plaything function?

This argument, like all arguments exclusively based on sensile perception of phenomena, must not be taken for more than it is worth. It is true that there may possibly exist, between bodies and integral parts of bodies, intervals so minute as to escape observation; even when these objects are inspected under the most powerful microscope. We are told that a German optician has actually ruled bands on a plate of glass 'containing 224,000 lines to the inch[1].' Nay, there does not seem to be any sufficient reason for denying that an *interval*—not a *vacuum*—may exist between two bodies, which is so infinitesimal as practically to exclude the possibility of sensile perception. But that interval must be filled by another foreign body. It is moreover incontestable, that there are a few exceptional instances of attraction and repulsion, in which the two bodies are distant from each other by an interval that is cognizable by the senses; and these will be discussed, when we come to the difficulties. Meanwhile, let us estimate the true force of the present argument. It is here assumed as a Lemma from ideology, that the faculty of sensibility under normal conditions is infallible in its normal representations,—considered as the material medium, by means of which the intellect is enabled to form a true judgment con-

[1] *Cooke's New Chemistry, Lecture* i.

cerning external facts or material phenomena. If, then, (as the examples given above conspire to show), the senses constantly, unvaryingly, spontaneously, present these material phenomena before the intellect in such a way, as to compel the latter to form a peremptory judgment, that no body can move another from its place without either immediate or mediate contact; to doubt the truth of the conviction, is to impugn the natural infallibility of the senses in their representation of the material phenomena that are before them. It is true that there may be other phenomena so minute as to escape sensile perception; and it is not inconceivable, that the presentation of these phenomena might induce the intellect to modify its judgment. But, as yet, these are mere conjectures, not facts; and they can have no weight against the strong witness of experience. If it be urged, that a contact, such as is represented by the senses, is not incompatible with an insensible distance between the bodies; two observations suggest themselves. First: The estimate of distance is necessarily relative. Though an interval may be infinitesimal when referred to sensile perception, it may yet be enormous when compared with the supposed molecules that constitute its limits; so that the argument of experience will acquire, by comparison, a yet greater cogency of proof. In the second place: Seeing that the actual testimony of the senses is in possession; we are more than justified in demanding the most cogent proof of the existence of these intervals, either in the shape of *à priori* demonstration, or of legitimate direct induction based on indubitable facts, which can be explained on no other theory. To these observations must be added a remark, the most important of all in the present contention. It must further be satisfactorily proved, in one or other of the above-mentioned ways, that these intervals are not filled by some other foreign body. Yet, on the contrary, it has been already proved by *à priori* demonstrations, that such empty intervals, or vacua, are impossible in this sense, that they are incompatible with the action of body on body; and it may be confidently asserted, that there are no physical facts as yet discovered or alleged, which—to say the very least—do not admit of as satisfactory an explanation according to the principles of the Scholastic philosophy, as that afforded by the putative existence of vacua. Lastly: One cannot help remarking, that this theory of atoms and molecules,—each isolated by a sur-

rounding vacuum,—is not a happy illustration of the boast of modern physicists, that physical science is exclusively based on certain induction from phenomena.

ii. In treating of the two other kinds of material motion,—viz. alteration in quality, increase and decrease of size in quantity,—it will help towards a closer acquaintance with Scholastic teaching in its bearings on modern physics, if we present the reader with a sort of paraphrase of the inductive[1] proofs of Aristotle on these heads, as elucidated by the *Commentaries* of the Angelic Doctor. To begin, then, with motion in the Category of Quality,—that is to say, with alterations, (ἡ κατὰ τὸ ποιὸν ἀλλοίωσις). The following is the argument of the Philosopher: Every kind of alteration resembles alterations that are made in the senses. But, in all sensile alterations, that which is proximate Efficient Cause and that which is Subject of the alteration are in immediate contact; and have nothing intervening between them. Therefore, in every alteration, the proximate Efficient Cause and Subject are together in such sense, that there is nothing whatsoever between them.

The *Major* is thus declared. Every alteration produced in bodies takes place in virtue of some sensile quality (some quality perceptible to sense) which, according to the Philosopher, is contained in the third species under the Category of Quality. For alterations in bodies are effected by means of those characteristic qualities, by which bodies are sensibly distinguished from each other; and experience assures us, that such distinction is due to these qualities which are capable of making their impressions on the senses. Thus, *heaviness* and *lightness*, *hardness* and *softness*, *dryness* and *moisture*, *density* and *rareness*, *heat* and *cold*, affect the sense of touch; *sound*, the sense of hearing; *odours*, the sense of smell; *sweetness*, *bitterness*, *acidity*, the sense of taste; *shapes* or *limits*, the senses of sight and touch. Now, all the above-mentioned—with the exception of the last which forms a species of its own—are included under the third species of *passible* qualities; so called, because they are of a nature either to be caused by some passion, or to cause some passive impression on the senses. It is further to be observed, that the above-named and kindred qualities are common to all bodies, inani-

[1] Τοῦτο δὲ δῆλον ἐξ ἐπαγωγῆς. *Physic. L.* vii, *c.* 2, *fi.*

mate as well as animate. But there are certain passible qualities which are peculiar to living bodies. These are the passive impressions received in the senses, which evidently inanimate bodies cannot possess. Hence it follows, that animate bodies are capable of all the passible qualities to which inanimate bodies are subject; and own, in addition, other similar qualities which are peculiar to themselves. Further: Of many of these sensile alterations, (of those, viz., which are effected in the senses), man is conscious in himself by virtue of his intellectual faculty. He knows them, or at least is capable of knowing them, both in their *fieri* or course of production and in their *facto esse* or constituted state; so as to be able to judge of the causality. Water can receive the quality of heat, but can neither feel nor know it. A dog can receive the same quality; he feels, but does not know it. Man alone can perceive, feel, and know. Hence, three conclusions: First: That there is a general resemblance between sensile and other alterations in bodies, sufficient for the purpose of forming a legitimate induction. Secondly: That alterations in the organs of sense form the surest and most satisfactory subject of inquiry and investigation, because of their intimate connection with the psychical facts of sensation. Lastly: That these alterations in the organs of sense, as produced in man, are still more satisfactory and more calculated to lead to a true judgment; because the human soul is conscious of them, throughout the entire phenomena of their motion.

The *Minor*,—wherein it is asserted that in all sensile alterations, or alterations in the organs of sense, that which is proximate Efficient Cause and that which is Subject of the alteration are in contact, having nothing intervening between them,—is proved by induction, based on facts of constant and general experience. For, 'in all these, it is at least plain, that the ultimate limit of the cause of alteration, and the ultimate limit of that which is Subject of the alteration, are together. For with it'—that is to say, according to the Angelic Doctor's interpretation of these abrupt words of the Philosopher, with the organ of sight,—'the air is continuous, and with the air the body,' which is object of vision. 'And, in like manner, the colour (is continuous) with the light, and the light with the organ of vision. It is precisely the same with the senses of hearing and of smell; for the proximate cause of motion, relatively to the

Subject of motion, is the air. It is so likewise with the sense of taste; for the flavour and the taste are together[1].' These instances are thus explained in the Commentaries of St. Thomas: 'The Philosopher proves that, in alterations produced in the organs of sense, the cause and Subject of alteration are together; because with the organ of sight the air is continuous,—that is to say, in immediate contact; while the visible body and the visible superficies of the body, which is the Subject of colour,' (in other words, of that which produces in us the sensation of colour), 'is continuous with the light,—that is to say, with the illuminated air,—which is continuous with the organ of sight. Thus it plainly appears, that the altered air and the agent of its alteration are together; and, in like manner, the altered organ of sight with the air that alters it. It is the same thing with the senses of hearing and of smell, if they are compared with the principal agent,—viz. the body that is object of sensile perception; because these senses are affected by the instrumentality of an external medium. But the sense of taste and flavour are together; for they are not connected by any external medium. Such is the case likewise with the sense of touch[2].' It will be seen by this paraphrase, that the Angelic Doctor discovers a just distinction between the two terms *συνεχές* and *ἅμα*, as they exist in the original. For some of the organs of sense are not in immediate contact with the body that is the principal agent of the passive impressions made on them; so that the two are not together. But they are continuous with the agent, in virtue of an intermediate body which is in immediate contact with both. So it is with the organs of sight, hearing, smell. Those of taste

[1] *Ἐν ἅπασί γε τούτοις φανερὸν ὅτι ἅμα ἐστὶ τὸ ἔσχατον ἀλλοιοῦν καὶ τὸ πρῶτον ἀλλοιούμενον· τῷ μὲν γὰρ συνεχὴς ὁ ἀήρ, τῷ δ' ἀέρι τὸ σῶμα. Πάλιν δὲ τὸ μὲν χρῶμα τῷ φωτί, τὸ δὲ φῶς τῇ ὄψει. Τὸν αὐτὸν δὲ τρόπον καὶ ἡ ἀκοὴ καὶ ἡ ὄσφρησις· πρῶτον γὰρ κινοῦν πρὸς τὸ κινούμενον ὁ ἀήρ. Καὶ ἐπὶ τῆς γεύσεως ὁμοίως· ἅμα γὰρ τῇ γεύσει ὁ χυμός. Phys. L.* vii, *c.* 2.

[2] 'Probat secundum quod in alteratione sensus alterans et alteratum sint simul, quia "huic," scilicet sensui, puta visui "aer continuus est," id est absque medio conjunctus; aeri vero corpus visibile et superficies quidem visibilis corporis, quae est subjectum coloris, "terminatur ad lumen," id est ad aerem illuminatum, qui terminatur ad visum. Et sic patet quod aer alteratus et alterans ipsum sunt simul, et similiter visus alteratus cum aere alterante; et similiter est in auditu et in odoratu, si comparentur ad id quod primum movet, scilicet ad sensibile corpus; quia hi sensus sunt per medium extrinsecum. Gustus autem et sapor sunt simul: non enim conjunguntur per aliquod medium extrinsecum, et simile est de tactu.' *In Phys. L.* vii, *Lect.* 4ª, *p. m.*

and touch, on the other hand, are in immediate contact with the bodies that produce in them the passive qualities which they respectively receive.

Let us now reconsider this teaching of Aristotle and St. Thomas in the light of modern physics, so as to establish more clearly the force of the argument, derived from it, in support of the present Proposition. In every instance of alterations effected in the organs of sense, as revealed to consciousness, the body, which is the principal agent of the alteration, is either immediately or mediately continuous with the organ; the proximate instrumental cause, (if there be one), is always immediately continuous. In the instance of sensations of sight, hearing, smell, the body that is principal agent is only mediately continuous with the organ. They, therefore, postulate a proximate instrumental cause, which is in immediate contact with the organ. Hence, in their case there are at least two alterations,—the one caused in the medium by the principal agent, and the other produced in the organs by the same agent, through the instrumentality of the medium. The object of sense produces a quality in the intermediate body, in and through which it makes an alteration in the material organ. Aristotle and St. Thomas have illustrated this fact at greater length in the instance of the organ of sight, as being for various reasons the most important of the senses. Let us pursue this illustration in the concrete: The colour of the rose-petals is reproduced in the retina of the eye. Yet the rose is in the garden some way off from the house; and the person, whose eye has received the impression, is standing at his window. Aristotle explains, and says that the air is in immediate contact both with the rose and with the organ of sight. The air acts as go-between; and is the proximate Efficient Cause of the passible quality or form produced in the eye. He adds, by way of making it clearer, that the light (which he seems to consider as a quality in the air) is in contact with the colour, or with that qualitative form in the petal that produces the sensation of colour; and that the same light—or illuminated air, as the Angelic Doctor calls it,—is in immediate contact with the eye. Substitute *ether*, in accordance with the modern theory, for *air;* and the explanation is fundamentally the same, as that which is now given in our modern books of Physics. This something in the rose-petal, (which is commonly called

colour, because it is Efficient Cause of the sensation of colour), is in immediate contact with the ether, which all will own to be practically continuous; and is, further, conterminous with the eye. Waves of ether of various length (for of such the beams of light are supposed to consist) impinge upon the rose. Not to enter into any elaborate detail, which would be out of place here: These waves produce some effect upon the flower itself, and not merely on the surface; for it is observable that very little light is reflected. In consequence of this internal alteration, the flower reacts on the contiguous ether; and propagates in all directions round itself—radiates—new waves of coloured light that reach the eye. Such at least is the interpretation now given of these phenomena. In this way the alteration is produced on the retina of the eye, by the all but countless oscillations of the contiguous ether. It may possibly be said, that the above explanation is liable to a double indictment; for it goes beyond the mere facts of experience, and moreover begs the question. The first accusation is, to a great extent, just; for the existence of an ether is a pure hypothesis, admirable perhaps for its purpose, but certainly not subject to sensile perception. But it must be remembered that light, and its necessity to the producing of a sensation of colour, and its universal dispersion through space, are facts of experience—that the production of the sensation of red by means of the rose-petal are facts of experience, which have been merely translated into a modern dialect. It may be further urged, that many of those physicists who hold to the existence of an ether, hold likewise to the existence of vacua between the supposed atoms by which it is constituted. True; but there are three observations which will probably go to enervate the force of the fact. First: This belief is by no means universal. Secondly: It is inconsistent with the theory, for two reasons,—one, that it destroys the very purpose, or final cause, on account of which the theory was invented, which was, to account for the action of bodies on each other at a distance;—the other, that it makes the ether useless in the world of being, since, if the action of bodies can pierce a vacuum, there is nothing to hinder the sun from giving light and heat everywhere by its own immediate action. Lastly: The explanation was given, to show once more the compatibility of the Scholastic doctrine with modern physical teaching. But, as has been

said, the immediate contact of the air and light with the eye is a fact of sensile experience or, at the least, of conviction based on sensile experience. It is not a metaphysical impossibility, that we may be deceived; nevertheless, the general conviction remains in support of the Proposition. The second accusation would be likewise just; if the undulatory theory had been introduced as a proof that, in the interaction of bodies, a vacuum is inadmissible. But the motive for its introduction has been already given. Of course, there could be no intention of maintaining the harmony between the two teachings; if the ether-theory must include the existence of intervening vacua. But such inclusion was never contemplated by its illustrious author, who distinctly states, in words already quoted under the first Prolegomenon, 'It is inconceivable that inanimate brute matter should, without the mediation of something else which is not material, operate upon and affect other matter *without mutual contact*. . . . That gravity should be innate, inherent, and essential to matter, so that one body may act on another, at a distance, through a vacuum, without the mediation of anything else, by and through which that action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man, who in philosophical matters has a competent faculty of thinking, can ever fall into it.' This is a remarkable testimony from so high an authority, acknowledged to be among the greatest geniuses of his age. Mr. W. R. Browne, in a paper read before the Physical Society of London[1], (a paper which will be fully considered in the *Difficulties*), has endeavoured, with but indifferent success, to weaken the force of Newton's testimony, by adding the words that immediately follow: 'Gravity must be caused by an agent acting constantly according to fixed laws; but whether this agent be material or immaterial, I have left to the consideration of my readers.' Mr. Browne discovers in this sentence an explanation and limitation of the judgment expressed; and thence concludes, that 'all which he (Newton) really says is that one body cannot, *uncaused*, act on another at a distance.' There are no apparent grounds, however, for asserting such a connection between the sentences; and, in any case, the interpretation of Newton's words is no compliment to their author. It would seem, as though it

[1] *Proceedings of the Physical Society of London, January to April*, 1881.

does not require distance or a vacuum to hinder one body, uncaused, from acting on another.

iii. The experience of our senses justifies the conclusion, that in quantitative motions,—that is to say, in increase or decrease of bulk of bodies,—the agent cannot at a distance act on the Subject of its causal action. The agent of these motions is either extrinsic or intrinsic, relatively to the body that is Subject of the change. An external agent acts by compression or extension, that is the result of physical force. An internal agent causes the change by natural operation proper to the Subject. To begin with the external agent: Its action on the body submitted to its force would necessarily be one either of traction or of pulsion; each of which (as has been already shown) postulates contact of agent with Subject. Take, by way of illustration, one of those caoutchouc manikins that are an innocent amusement of *children* in every period of life. The face becomes long and tragical, or comical and broad, the figure tall or diminutive, accordingly as we pull or press; but who amongst us doubts, unless his common sense has been affected by some previous bias, that the immediate contact of the hands with the toy is requisite for the production of these results? The same is apparent in the distension of a lump of gold into thin-drawn wire. In the instance of an internal agent the case is yet more plain. When proportioned volumes of hydrogen and oxygen become water by chemical combination; what a vast disproportion there is between the added bulks of the two gases and that of the resultant water! This decrease is the effect of the substantial form of the water, which postulates a greater density in the matter. So, in the instances of living things, the bulk is enlarged by nutrition, and diminished by the various fecal discharges. But this is effected again by the substantial form; which, by means of its appropriate faculties, attracts to itself, or repels from itself, quantified matter that is accidental to the nature of the Subject. But there must be immediate conjunction between the substantial form and the quantity which it modifies and claims as its own. No one would venture to deny, if his mind were free to form a sober judgment, that the food taken by an animal and absorbed into its system, and the quantity or extension of the food, as well as that of the whole quantity of the living body during and after the processes of assimilation and transformation, are not in immediate union with

the substantial form; or that the tears which fall from the eyes are immediately connected, up to the time of expulsion, with the creature that sheds them.

One more remark it is necessary to repeat, before concluding the present argument from the testimony of experience. Generation and corruption have not been here enumerated among the action of bodies on bodies; because they are not actions, but instantaneous acts. So far forth as they connote previous action; they belong to alteration, or alterative motion. The sum of the argument, then, is this: The senses bear witness, (so far as their evidence can normally go), that, when one body produces either locomotion or alteration in Quality or changes in Quantity, the agent is in either immediate or mediate contact with the Subject of its operation. This argument has its value as a corroborative proof; but, if taken by itself and apart from *à priori* demonstration, it would be of comparatively little worth; because the hypothetical ultimates of bodies, with their train of supposed vacua, transcend the limits of sensile experience. Even so, however, they serve for an argument from analogy. For it is not becoming to suppose, that an infinitely wise Creator would so ordain, that this constitution of the material universe, when carried beyond the range of sensile perception, should be based on principles contradictory to those which it manifestly exhibits, for so long as it is subject to the experience of the senses.

III. The last *à posteriori* argument is derived from evidence supplied by modern physical science; and may be thus briefly stated. Some of the fundamental principles and laws of nature, as revealed in modern physics, are incompatible with the immediate action of one body on another; in the hypothesis that the two are separated by an intervening vacuum.

i. It is all but axiomatic in physical science, that *de facto* the activity of bodies is limited within a certain sphere. The more powerful the magnet, the greater the distance at which it can exercise its power of attraction; but, in the instance of even the most powerful, there is found to be a limit beyond which its sensible effect on a fitting Subject ceases. If the Leyden-jar, however fully charged, is separated beyond a certain distance from the discharging-rod; the electricity does not pass. The match will not set fire to the fuel in the grate, unless in sensible contact with it; and the fire itself,—when lighted,—burns, heats,

or only warms, or at length has no perceptible effect, in proportion to the nearness or distance of the Subject of its activity. The nearer the source of the air's vibratory motion to the ear, the clearer become the perceptions of sound. The sweet odour of flowers becomes fainter and fainter, as we move further and further away from the flower-bed. Friction can only take place, when to all appearance the bodies are in contact. The same holds good universally in the instance of touch-sensations. It will not be amiss to illustrate this section of the argument from a well-known Work on *Physics*. Professor Atkinson has translated Ganot's *Éléments de Physique* into English, for the use of Colleges and Schools. No authority could be more unexceptionable. At the commencement of the Treatise, we are introduced to the atomic theory as to an established fact; and are plainly told that these atoms 'are retained side by side, without touching each other, being separated by distances which are great in comparison with their supposed dimensions[1].' The author, then, is clear from all suspicion of a leaning towards the Scholastic teaching. Now, let us see what he has to tell us about friction. He plainly considers the subject as one of great physical importance; for his mode of commending it to the notice of his readers is almost rhetorical. 'Without friction,' he emphatically announces, 'on the ground, neither men nor animals, neither ordinary carriages nor railway carriages could move. Friction is necessary for the transmission of power from one wheel to another by means of bands or ropes; and without friction we could hold nothing in our hands[2].' So striking a preface naturally excites curiosity to know what this friction is. The Professor supplies us with a kind of description; and here it is. 'In the cases of the actions of machines which have been described,' thus he writes, 'the resistances which are offered to motion have not been at all considered. The surfaces of bodies *in contact* are never perfectly smooth; even the smoothest present inequalities which can neither be detected by the touch nor by ordinary sight; hence when one body moves over the surface of another the elevations of one sink into the depressions of the other, like the teeth of wheels, and thus offer a certain resistance to motion;

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[1] *Atkinson's Elementary Treatise on Physics, Book* i, *ch.* i, *n.* 3.
[2] *Ibid. ch.* iii, *n.* 45.

this is called friction. . . . Friction is of two kinds: sliding, as when one body glides over another; this is least when the two surfaces *in contact* remain the same. . . . Friction is independent of the extent of surfaces *in contact*[1].' Yet another instance from the same Work: 'Adhesion,' so the Professor tells us, 'is the molecular attraction between bodies *in contact*[2].' The following is given as an illustration. 'In the operation of gluing, *the pores and crevices of the fresh surfaces* being filled with liquid glue, so that there is *no empty space* on drying, wood and glue form *one compact whole*[3].' It would not be fair to press the expressions, that have been italicized, home to the learned Professor too strictly. Doubtless, an explanation could be given, which would make them square with the atomic theory which has been set on the forehead of the Treatise; as, for instance, that they are to be interpreted according to the perception of the senses. But, without any injustice, attention may be called to the fact, that the Professor, in explaining and illustrating the phenomena of friction and adhesion, is compelled to make use of phrases that seem to exclude vacua, and are in harmony with the judgments of common sense, and with the philosophy of the School. To revert to the argument, based on the physical law that was illustrated at the commencement by examples: If there should be an intervening vacuum between the agent and its Subject and, nevertheless, the force of the former should act immediately on the latter; there does not appear to be any sufficient reason, why the energy of the force should be modified by distance. According to the hypothesis, the force is not self-diffusive; otherwise, there would be no vacuum. Hence it is in act, only where it energizes. If, then, we suppose no obstacle in the shape of some other body, but simply vacuum; since the vacuum counts for nothing because it is not invaded, and since, —even if invaded,—as a mere privation it could do nothing; the extent of the putative vacuous distance could have no imaginable effect on the activity of the force. How far the intervention of bodies may limit the action of the force, will be considered in a subsequent Proposition.

ii. If there be one principle or law in modern physics more

[1] *Atkinson's Elementary Treatise on Physics, Book* i, *ch.* iii, *n.* 45.
[2] *Ibid. n.* 83.
[3] *Ibid.* The italics have been introduced in all these quotations.

fundamental and of more universal application than any other, it is the great law—or rather two laws—of Newton, that the attraction between two bodies is directly proportional to their mass, and inversely proportioned to the square of their distance from each other. It is to this last-mentioned law, that the attention of the reader is more particularly invited; for it not only rules the attraction of bodies and the phenomena of gravitation, but likewise the phenomena of intensity of sound, of radiant heat, of light, of electrical attractions and repulsions. Now, if there existed a vacuum between the Efficient Cause and the Subject; it is difficult to discover any sufficient reason for a decrease in the energy of the force in proportion to the distance. There could be no reason on the part of the force; since, according to the hypothesis, it is the same force of the same agent. There could be no reason on the part of the Subject; since it is the same, and its disposition is supposed to be the same. Finally: There could be no reason on the part of the vacuum; because a vacuum, absolutely in itself, is a non-entity. Howsoever, therefore, its extrinsic and imposed dimensions might vary; in no case could it affect the intensity of the force. Consequently, there is nothing to prevent a bodily force from producing its effect on the Subject at a distance of millions upon millions of miles, with the same intensity as though it were separated from the same Subject only by the thousandth part of an inch: What is there to hinder it? But should this be the case, the first law—viz. that the attraction between any two given bodies is directly proportioned to their mass—would have no counterpoise; and, as a consequence, all bodies would have an irresistible tendency to centre in the largest and weightiest of the heavenly bodies, as the common focus, in virtue of its superior mass. Take a single instance by way of illustration: It is now conjectured by many competent authorities, that the rings of Saturn are formed from aërolites. A new ring has more recently been discovered; and, according to the same conjecture, this *crape* ring (as it is called) has been formed by aërolites that have been jostled out of the other rings by collisions, and have been attracted towards the planet. On the hypothesis of a vacuum, the attractive force of the sun would be as intense at the crape ring of Saturn from its present distance, as though it were not a yard off. If so, these aërolites, supposing them

to be such,—to say nothing of those which compose the other rings,—would be at once attracted towards the sun, and would desert the planet. Of course, if it is maintained that ether or some other material substance occupies the space of heaven, the argument would lose its force; but then the hypothesis is changed. How far and under what conditions the new hypothesis would affect the question, will appear in a subsequent Proposition.

iii. It would seem that, in the action of forces, modern physical science invariably recognizes the necessity of a medium; when the agent is locally separated from the Subject of its action. We have already seen, that it was this motive which induced Newton to introduce an all-permeating ether; and we know how this same ether is made to serve as medium, in the phenomena of light, colour, and heat. Experiment and observation have established the fact of the conductibility of heat, and that different bodies have a different conductive power. Some are good conductors,—as metals, for instance; others are bad conductors,—glass, for instance, liquids, and gases. It is further to be observed, that the heat occupies an appreciable time in passing along the conductive body. This is very clearly perceptible in the apparatus of Despretz, who by means of it has been enabled to establish a law of considerable interest in relation to the present argument. The law, as Ganot gives it, is as follows: 'If the distance from the source of heat' (the Efficient Cause) 'increase in arithmetical progression, the excess of the temperature over that of the surrounding air decreases in geometrical proportion[1].' It may be said, then, that the force of conducted heat diminishes with the distance, till it gets spent. This is a point in the phenomena of heat, which will be of service later on. At present it suffices to notice, that heat is transmitted by conduction, and that the thermal conductivity of bodies varies, according to their difference of constitution in some way or other. But what does this mean? It means that heat, in order to act upon a distant body, or—which amounts to the same thing—to a distant part of the same body, requires a medium; that such medium is sensibly continuous; and that, when the intervening body or parts of the same body are ill disposed for becoming media, the principal agent is unable to

[1] *Atkinson's Elementary Treatise on Physics, B.* vi, *n.* 378.

produce its normal effect on the distant body. It is true that heat is likewise transmitted by radiation; but, in order to reduce these phenomena under the common law, modern physics recognizes a conductor in the ether.

Still more striking are the phenomena of conduction in the instance of electricity. Bodies, in their relation to this force, have been divided into conductors, semi-conductors, and non-conductors, according to the small, moderate, or great resistance which they offer to the passage of the electric fluid. The following is a curious exemplification, borrowed from Ganot: 'When a dry glass rod, rubbed at one end, is brought near an electroscope, that part only will be electrified which has been rubbed; the other end will produce neither attraction nor repulsion. The same is the case with a rod of shellac or of sealing-wax. In these bodies, electricity does not pass from one part to another—they do not *conduct* electricity. Experiment shows, that when a metal has received electricity in any of its parts, the electricity instantly spreads throughout its entire surface. Metals are hence said to be good conductors of electricity[1].' Experimentalists, as is well known, take advantage of the non-conductive properties of certain bodies, to use these as insulators; by means of which they may be enabled to manipulate the strongest charged batteries with impunity. Somewhat similar arrangements are frequently made in the manufacture of teapots and urns, for the purpose of preventing the handles from becoming inconveniently hot. These and similar facts of observation, conjointly with the theories alluded to at the commencement of this proof, serve to establish two points: (*a*) That modern physics acknowledges the necessity of a medium, or subsidiary instrumental cause; when the bodily agent is at a distance from the body, towards which its action is directed; (*b*) That it admits action to be impeded by an unfit medium. But both these admissions are utterly at variance with the existence of a vacuum, intervening between the agent and the Subject. This conclusion is further confirmed by the fact, that the medium is in immediate contact with both bodies. In electricity there are apparent exceptions which, however, on closer inspection only serve to confirm the law. Electricity may pass (to use the

[1] *Atkinson's Elementary Treatise on Physics, Book* ix, *n.* 684.

ordinary word, though not a little misleading) from one metal ball to another, though the two are at a certain distance from each other; but the spark shows that the electricity has made use of the intermediate air as a medium, or—to put it in the scientific language of the School—the form of electricity in the electrified ball has produced a similar form in the intervening air; and, in and by the air as its instrumental cause, has evolved a like form in the other ball which is Subject of its action. The conclusion hardly stands in need of declaration. To admit that bodies require a medium in order to produce an effect on another distant body, is tantamount to an admission that one body cannot act immediately on another body, without the aid of some instrumental cause that is in contact with each; and no one can be so unreasonable as to maintain, that a vacuum could ever become a physical instrumental cause. In like manner, if a certain force is capable of acting upon a distant body, when conjoined with it by means of a conductor or fitting medium; while the same force, under precisely similar circumstances and conditions, is unable to produce its effect on the same body, when a non-conductor has been substituted in place of the conductor; it is plain, that the one could not act upon the other with a vacuum between the two, since a vacuum, so far forth, would be identical in its results with a non-conducting body.

To sum up: Even if, for the sake of argument, we consent to entertain the hypothesis of the possibility of a vacuum; it is, notwithstanding, absolutely impossible that, in the order of nature, bodies should be able to act on one another, if a vacuum should interpose between them. It is impossible, because it contravenes the essential proportion subsisting between the first and second act of being; because it is repugnant to the essentially imperfect nature of bodily substance, that it should be capable of acting beyond the limits of its own proper extension; because it is essentially incompatible with the respective relations of motion to agent and Subject; because there would be no sufficient reason for the determination of the action of the agent to one body more than any other. These *à priori* demonstrations are confirmed by the common sense and common conviction of mankind. They are further confirmed by the constant testimony of the senses, as touching physical phenomena. They are, in the last place, confirmed by the fact, that

the theory in question is out of harmony with the established laws and principles which govern the interaction of bodies, and are universally accepted as such by modern physicists.

DIFFICULTIES.

I. It is impossible that one body should produce motion in another, if the two are in immediate contact. Consequently, it is necessary to all bodily motion, that a vacuum should exist between the agent-body and the Subject-body. The author of this objection would fain establish its truth by means of the two following Propositions:

PROPOSITION I. *No natural cause can communicate a finite velocity to a body, in an infinitesimal unit of time.*

DEMONSTRATION. If any natural cause could communicate a finite velocity to a body, in an infinitesimal unit of time dt; it evidently could communicate to it an infinite velocity in any finite time. For let v be the intensity of the action of that cause, for a finite unit of time; the intensity of the action, in an infinitesimal unit of time dt, will be vdt. If, therefore, vdt were of a finite intensity, in order to produce finite velocity; then v itself must be of an infinite intensity. But it is clear that no natural cause exerts, in a finite unit of time, an action of an infinite intensity; for we never see, nay we cannot even conceive, a motion of infinite velocity as possible. Therefore, every action v of any natural cause whatever is of finite intensity; and, consequently, every action vdt is of an infinitesimal intensity. But an action of infinitesimal intensity cannot communicate to a body a finite velocity. Therefore, no finite body can communicate finite velocity to a body in an infinitesimal unit of time.

PROPOSITION II. *In the impact of bodies, no communication of finite motion can be made, by means of a true and immediate contact of matter with matter*,—that is to say, speaking philosophically, of body with body.

DEMONSTRATION. The true and immediate contact of matter with matter (body with body) would take place in the indivisible instant, in which the distance between the points which are coming into contact becomes $= 0$. But finite velocity cannot be communicated in an indivisible instant, as we have seen. Therefore, there can be no communication of finite velocity by

means of a true and immediate contact of matter with matter, (body with body). If it be urged against this conclusion, that, though the argument might hold good if the contact took place only at one point, yet that finite velocity might be communicated, if the contact should take place at a variety of points; answer is made, that, since each individual contact does not contain the causality of each partial effect, it is evident that the multitude of such contacts cannot contain the causality of the total effect. And, in fact, if each individual point of matter (a body) only acquires an infinitesimal velocity *vdt*, the whole multitude will acquire only an infinitesimal velocity; that is, there will be no motion caused at all. If it be further objected that, though motion may possibly not be communicated by instantaneous, yet it is capable of being communicated by prolonged, contact; it is urged in reply, that a prolonged contact is impossible, unless the velocities have become equal at the very commencement of the contact. Therefore, if velocity were communicated by the contact of matter with matter (body with body); it would have to be communicated in the very first instant of the contact, not in its prolongation. If, once more, it should be urged, that the argument does not take any account of the elasticity of bodies; reply is made, that elasticity is the power of reacting after compression, and cannot be exercised till after the action, which works a change in the body, has taken place. Therefore, if the body is not changed by an instantaneous contact; there can be no reaction owing to elasticity.

Answer. It is absolutely necessary to a clear comprehension of the metaphysical solution, to be presently given, of this mathematical problem, that certain *Prolegomena* should be prefixed, which will partly contain a more detailed exposition of certain points of doctrine, taken from the Angelic Doctor, that have been already touched upon; partly will consist of sundry Lemmata borrowed from future disquisitions. The reader will excuse a certain amount of repetition, which under the circumstances is unavoidable.

Prolegomenon I.

The continuous, whether it be stable and simultaneous or in flux and successive, potentially includes an infinity of parts, or—to speak more accurately—an indefinite number of potential parts. Hence, considered either metaphysically or mathematically,

it is capable of illimitable division; whereas, considered physically, it is impossible not to acknowledge that there must be a limit to its capability of division. The reason for the one proposition is, that to whatsoever extent the continuous; is divided, the parts must still remain continuous; and, as being continuous, retain their essential capacity for further division. The reason for the other proposition is, that continued physical division and subdivision will necessarily at length result in reducing the parts to a minimum, beyond which the material substance of each part would become unfit for retaining its quantitative extension. This distinction is very perspicuously and succinctly stated by St. Thomas, in a passage that has been partially cited before. 'A natural body,' he writes, 'is not infinitely divisible, but a mathematical body alone is so; as is gathered from the fifth Book of the *Physics*, and from the words of the Commentator. . . . A mathematical body means a body, considered exclusively in regard of its quantitative dimensions; and this is body in the Category of Quantity;' because the mathematical science makes abstraction of all *that* in a natural body, which brings it under the Category of Substance. 'This, then, is capable of infinite division; because, in the nature of continuous quantity, there is nothing that is repugnant to division. But a natural body means one that is conceived according to a certain determinate species and faculty. This is not infinitely divisible; because every species postulates a determinate quantity, in regard of its increase as of its decrease. For, as it is said in the second Book *De Anima*, in all things that are constituted by nature, a limit and character of size and of increase has been established. Consequently, it is possible to arrive at a minimum of water and a minimum of flesh, as it is said in the first Book of the *Physics;* and, if this should be divided, it would no longer be water and flesh[1].' Hence, we are justified in the conclusion that, according

[1] 'Corpus enim naturale non est divisibile in infinitum, sed solum corpus mathematicum, ut ex 5 Physic. ex verbis Commentatoris et Philosophi habetur. . . Et dicitur corpus mathematicum, corpus consideratum secundum dimensiones quantitativas tantum, et hoc est corpus in genere quantitatis: hoc enim in infinitum dividi potest, quia in ratione quantitatis continuae non est aliquid quod divisioni repugnet. Corpus autem naturale dicitur quod consideratur secundum aliquam determinatam speciem et virtutem: et hoc non potest dividi in infinitum, quia quaelibet species determinatam quantitatem requirit et in plus et in minus: sicut enim dicitur in 2 de Anima, omnium natura constantium positus est terminus et ratio magnitudinis et augmenti: et ideo est invenire minimam aquam et minimam

to the teaching of the Angelic Doctor, though the continuous *as continuous* is indefinitely divisible from a metaphysical and mathematical point of view, yet a quantified substance, or body, in the order of nature is not so divisible.

Prolegomenon II.

Locomotion is continuous and successive. Space is the measure of its continuity; time, of its succession. Of these two measures space is continuous, but not successive; time is both continuous and successive. Space and time may be taken mathematically as functions of locomotion; for, in mathematical phrase, 'When the successive values of a variable quantity depend according to a fixed law on those which another variable quantity assumes, the former quantity is called a function of the latter.' The velocity is the rate of motion, or the relation which the motion bears to space and time[1]. Space and time together are the measure of the velocity of motion. From these first principles it follows, that between any given unit of motion, unit of time, and unit of space, there is a definite ratio. It further follows that, within the limits of the same order, the unit of motion and of time must be continuous and successive. Unless it were so, the former could not belong to motion, or the latter to time; since both motion and time are essentially continuous and successive.

Prolegomenon III.

Keeping strictly within the limits of the physical order, (with which alone we are at present concerned), the continuous under every form postulates two limits,—the limit, or term *whence*, and the limit, or term *whither*. In motion the two terms, or limits, for present purposes may be said to be two rests, —rest antecedent, and rest consequent; in time, the two limits are two instants; in space or place, relatively to locomotion, two points. In no one of the three cases can the limits themselves be continuous, although they are limits of the continuous. Accordingly, they cannot be quantitative; although they are included under the Category of Quantity,—at least, moments and points,—as being modes and limits of it. Hence, there are certain fundamental characteristics of these limits, by which they

carnem, ut dicitur in 1 Physic.; quae si dividatur, non erit ulterius aqua et caro.' 2 *d.* xxx, *Q.* 2, *a.* 2, *c.*, *v. m.*

[1] 'Velox et tardum determinantur tempore.' *Opusc.* xliv (*aliter* xli), *c.* 2, *p. m.*

are essentially distinguished from the quantities which they terminate.

i. In the limit itself there is nothing of prior and posterior; while in the quantity limited there is. An instant, as we gather from St. Thomas, includes nothing in itself, that can be conceived as prior and posterior; but it is conceived as being all at once the whole of that which it is[1]. Similarly, rest (according to the explanation that will presently be given) presents, as limit of motion, no priority or posteriority. In the same way, a point has no parts, and 'is all at once the whole of that which it is.' On the contrary, time in general essentially consists in a certain protracted succession. 'It is the number of motion[2];' 'the number of priority and posteriority in motion[3].' So, again, motion is successive and quantitative; as is a line likewise.

ii. The limit is indivisible; the continuous limited is divisible.

iii. Each actual division of the continuous postulates two limits; consequently, the number of limits will be always double that of the parts divided[4].

iv. The separate and divided parts of motion, time, and space must themselves be continuous; those of time and motion, successive also[5]. Hence,

v. An instant is no part of time; rest broken or begun, no part of motion; a point, no part of a line; nor a line, any part of space[6].

vi. Since the limits are indivisible, and not continuous; an instant cannot add to time, rest to motion, or a point to a line and space[7].

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[1] 'Sicut et essentia instantis est tota simul.' *Opusc.* xxxvi (*aliter* xxxii), *c.* 2. 'Duo indivisibilia temporis nostri.' *Ibid. c.* 1. 'Quando intelligimus aliquod indivisibile, puta A, oportet quod ipsum solum simul intelligamus, cum non habeat quid prius et quid posterius intelligatur; est enim indivisibile.' *Ibid.*

[2] 'Tempus dicitur 4 Physic., numerus motus.' *Ibid. c.* 1.

[3] 'Tempus enim est numerus prioris et posterioris in motu.' *Ibidem.*

[4] 'In hac ergo linea constituta per diversitatem puncti, erunt puncta quaedam duo actu ut ejus termini, qui cadunt in ejus definitione: . . per quem modum de instanti temporis est agendum.' *Ibid. c.* 2.

[5] 'Quaelibet pars temporis est tempus. . . . Sicut ergo si nihil fuisset medium inter illa duo nunc, non fuisset tempus. . . Cum autem percipimus motum et determinamus prius et posterius in ipso, tunc percipimus tempus.' *Opusc.* xliv (*aliter* xli), *c.* 2.

[6] 'Licet punctus non sit quantitas, quia est quid indivisibile; et principium quantitatis, quia est principium lineae.' *Opusc.* xlviii (*aliter* xliv), *tr.* 3, *c*° 4.

[7] 'Punctum additum vel subtractum lineae non facit majus vel minus; et similiter est de instanti apposito tempori vel subtracto ab eo.' *Quol.* vii, *a.* 9, 2[m].

vii. It follows that no conceivable number of instants can constitute time, or of points a line or space.

viii. Wherefore, an instant cannot measure motion; because there is an entire disproportion between the two.

ix. When the potential parts of a continuous quantity are conceived as actual; the last limit of the preceding part is identical with the first limit of the part immediately succeeding. The same *now*, that is the end of the time past, is the commencement of the time future.

x. The limits in each instance are Modes in the Category of Quantity, separated by the continuous quantity which they determine. Thus, between two rests there is motion; between two points, a line; between two instants, time.

Note. To some it may seem, that to make rest the indivisible term of motion begun and ended, and to compare it with the points of a line or with instants defining time, is to contravene the teaching of the Philosopher, who in the sixth Book of his *Physics* asserts that quiet, like motion, is not producible in an instant, but only in time; because it is in its nature continuous. In truth, local rest necessarily postulates time. A body at rest differs from a body in motion by virtue of this, viz. that the former remains in the same place at different instants of time; for even a body in motion is evidently in one place at one indivisible instant of time. The following passage will serve to remove this apparent discrepancy. 'It is of the nature of quiet,'—so writes the Angelic Doctor,—'that an entity at rest is not different now from what it was before; and, consequently, in each and every *now* of the time that measures rest, the entity at rest is in the same place,—at the first, in the intermediary, and at the last moment. But it is of the nature of motion, that the entity which is moved is different now from what it was before. Wherefore, in each and every *now* of the time that measures motion, that which is moved finds itself in another and another disposition. Hence, it is of necessity that in the last *now* it should have a form of ubication, which it had not before. Thus it is plain, that to rest an entire period of time in anything,—in whiteness for example,—is to be in it at each and every instant of this time. Hence, it is impossible that anything should rest during an entire period of the preceding time in one term, and that afterwards, at the last instant

of that time, it should be in another term. This, however, is possible in motion; because to be moved during the entire period of any time, is not to exist in the same disposition at any whatsoever instant of that time[1].' Let us draw out, under the form of synoptical headings, the teaching of St. Thomas in this passage. (i.) Because it is in the essential nature of quiet, or rest, that it should remain the same,—that is to say, that the entity at rest should remain in the same disposition,—from the beginning to the end of the time by which it is measured; it has an intrinsic *terminus a quo* and an intrinsic *terminus ad quem* by virtue of its duration, which is its commencement and its end; for it is the same at the first and last instant, as in all the intermediary between the two. (ii.) Because motion is of its nature successive, it cannot have an intrinsic term *whence* or an intrinsic term *whither;* because at each instant, from first to last, it is in a different disposition from what it was before. (iii.) Hence, motion must be terminated by two extrinsic terms,—terms, that is, extrinsic to itself, not to its Subject. (iv.) We shall see from the following passage, that St. Thomas discovers these terms in the quiet that precedes and succeeds motion. 'All motion,' he writes, 'proceeds from the immoveable, as Augustine says; quiet likewise is the end of motion, as it is said in the fifth Book of the *Physics.* And as motion is related to quiet as to its beginning, at once, and its end; so also the reason is compared to the intellect, as motion to quiet and as generation to existence[2].' Thus, the extrinsic term *whence* of motion is the antecedent quiet at its last moment; and the term

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[1] 'De ratione enim quietis est quod quiescens non aliter se habeat nunc et prius, et ideo in quolibet *nunc* temporis mensurantis quietem quiescens est in eodem *ubi,* in primo et in medio et in ultimo. Sed de ratione motus est quod id quod movetur, aliter se habeat nunc et prius. Et ideo in quolibet *nunc* temporis mensurantis motum, mobile se habet in alia et alia dispositione. Unde oportet quod in ultimo *nunc* habeat formam quam prius non habebat. Et sic patet quod quiescere in toto tempore in aliquo, puta in albedine, est esse in illo quolibet instanti illius temporis. Unde non est possibile ut aliquid in toto tempore praecedente quiescat in uno termino, et postea in ultimo instanti illius temporis sit in alio termino; sed hoc est possibile in motu, quia moveri in toto aliquo tempore est non esse in eadem dispositione in quolibet instanti illius temporis.' I^{ae} liii, 3, *c.*

[2] 'Motus autem omnis ab immobili procedit, ut dicit Augustinus, 8 super Genes. ad litteram: motus etiam finis est quies, ut in 5 Physic. dicitur. Et sicut motus comparatur ad quietem et ut ad principium et ut ad terminum; ita et ratio comparatur ad intellectum ut motus ad quietem, et ut generatio ad esse.' *Verit. Q.* xv, *a.* 1, *c.*, *v. m.*

whither is the succeeding quiet at its first moment. It is true that, elsewhere, St. Thomas makes mention of an intrinsic term of motion. 'As in every part of a line,' he writes, 'it is possible to imagine a point; so, in every part of motion, it is possible to conceive a perfected change. For all motion, if it is terminable at all, is terminated to perfected change as to an intrinsic term; just as a line is to a point[1].' Here, as elsewhere, the Angelic Doctor is simply following in the footsteps of the Philosopher. It is observable, however, that he speaks of such terms of motion as being simply conceptual; whereas, in the former passage, he seems distinctly to exclude anything like a real *intrinsic* term of motion. But there is something more to be said. It will be remembered, that St. Thomas has adopted, as his own, the Aristotelian definition of motion,—viz. that it is the act of an entity existing in potentiality. Now, by an abstraction of the mind, one may represent to oneself the motion as the act of an existent, and not consider the potentiality to further act; and this one may do at any part of its course. Thus, speaking of a man on a journey, we may conceive him as having reached so far, without considering the rest of the journey he has to perform; and thus we form the idea of a perfected change. But how? Only by conceiving the journey to have come to a temporary stop. In a word, we introduce a *rest*.

One thing more: There is a marked difference, which must not be neglected, between *rest* as term of motion, and either a point or an instant in relation to their respective quantities. Because the former is extrinsic to the motion, it is not generic of motion; whereas an instant is generic of time, and a point is generic of a line, and so onward to the formation of a space. St. Thomas describes a line to be the result of the motion of a point; and he asserts that *now*—the present moment—is the only true element in time, moving through the past and invading the future.

Prolegomenon IV.

Velocity is a property of motion, and is measured by space and time. *Quick* and *slow*, therefore, are applied to time ana-

[1] 'Sicut in qualibet parte lineae est imaginari punctum, sic in qualibet parte motus est considerare mutatum esse: omnis enim motus, si terminabilis est, terminatur ad mutatum esse sicut ad terminum intraneum, sicut linea ad punctum.' *Opusc.* xlviii (*aliter* xliv), *tr.* 3, *c°* 7.

logously, according to analogy of attribution of the first class. Such is the teaching of St. Thomas. 'Because time is continuous,' he writes; 'it is therefore said to be long or short. But it is not designated as quick or slow; because, seeing that time is the number of motion, if it were designated as quick or slow, this would be either on account of number or on account of motion. But it cannot be so called on account of number; for number is not designated as either quick or slow; not on account of motion, for though time has something of motion, nevertheless it cannot be said that time is motion. Wherefore, it is not allowable to predicate the properties of motion—which are quick and slow—of time. For quick and slow are determined by time; and, in consequence, time is not designated as quick or slow. . . . Now, we measure motion by time, and time by motion; forasmuch as we determine the one by the quantity of the other.' This is plain: For the measure of time is the motion of the heavens; while, again, time and space measure motion. 'For we measure motion by time; because time in its proper nature is the number of motion,'—the arithmetic of motion. 'We likewise measure time; inasmuch as, by the quantity of motion known to us, we determine the quantity of time. For we say that the time is a great deal; because the motion which is accomplished in the time is a great deal. And this is in conformity with reason. For motion follows magnitude, as regards continuity and succession; and time follows motion. Now, by magnitude we measure motion, and *vice versa*. For we say that the motion is great, because the magnitude over which the motion passes is great; and, in like manner, we say that the magnitude' (space) 'is great, because the motion that passes over the magnitude is much. Wherefore, after a similar fashion, we determine the quantity of time by the motion, and the quantity of motion by the time[1].' Consequently, as time and space are factors of motion, (see Prolegomenon II); so they are together the measure of its velocity, or of its essential attribute.

[1] 'Et ideo tempus, quia est numerus, dicitur multum et paucum. Longum autem et breve sunt passiones continui, unde linea dicitur longa vel brevis. Et quia tempus est continuum, ideo dicitur longum vel breve. Velox autem aut tardum non dicitur: quia cum tempus sit numerus motus, si diceretur velox aut tardum, aut hoc esset ratione numeri, aut motus: non ratione numeri, quia numerus neque velox neque tardus dicitur: neque ratione motus: quia licet tempus sit aliquid motus, non est tamen dicere quod tempus sit motus. Et ideo non

Prolegomenon V.

An infinitesimal is an infinitely small quantity which is not determinate, so as to have an actual assignable value. It is, on the contrary, a quantity essentially variable that tends towards zero[1]. Infinitesimals may consist of any number of orders; in such wise, that one of the first order will be infinitesimally small relatively to some finite quantity, one of the second order infinitesimally small relatively to one of the first order, one of the third order infinitesimally small relatively to one of the second order; and so on. Accordingly, an infinitesimal is, in itself formally, a pure concept of the mind, to which there is nothing in nature that corresponds; having, however, for a real foundation the metaphysical truth, that the continuous is indefinitely divisible. Nevertheless, not even this principle is physically true; as has been made clear from the teaching of St. Thomas. The infinitesimal enters as an essential element into the differential calculus,—a grandly ingenious mathematical artifice for making disparates commensurable, and so reducing them to unity. Thus,—to take an illustration,—it is impossible to square the circle, because a straight line and a curve are disparate; but, in proportion as the sides of the polygon are multiplied and proportionally diminish in size, the difference between a side, or chord, and the arc of the circle which it subtends, becomes smaller. Since, then, the limits of the area of the polygons inscribed is the periphery or surface of the circle; it is plain that, in pro-

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oportet passiones motus, quae sunt velox et tardum, dici de tempore: quia velox et tardum determinantur tempore, et ideo tempus non dicitur velox nec tardum. . . . Mensuramus autem motum tempore et tempus motu, inquantum determinamus quantitatem unius per quantitatem alterius: motum enim mensuramus tempore, quia tempus secundum id quod est, est numerus motus: tempus etiam mensuramus, inquantum scilicet, per quantitatem motus nobis notam determinamus quantitatem temporis: dicimus enim, quod tempus est multum, quia motus qui factus est in tempore est multus. Et hoc rationabiliter accidit. Motus enim sequitur magnitudinem quantum ad continuitatem et prius et posterius; et tempus similiter motum. Per magnitudinem autem mensuramus motum, et e converso: dicimus enim quod motus est multus, quia magnitudo supra quam est motus, est multa; et similiter dicimus quod magnitudo est multa, quia motus supra magnitudinem factus est multus. Quare et similiter determinamus quantitatem temporis per motum et quantitatem motus per tempus.' *Opusc.* xliv (*aliter* xli), *c.* 2.

[1] 'Une quantité infiniment petite ou un infiniment petit n'est pas donc une quantité déterminée, qui ait une valeur actuelle assignable; c'est au contraire une quantité essentiellement variable qui tend vers zéro.' Sturm's *Cours d'Analyse*, 1re *leçon.*

portion as the sides of the polygon tend towards zero, the more *infinitesimal* becomes the difference between the area of the polygon inscribed and the area of the circle. In fact, as M. Sturm informs us, it was in the course of seeking to discover some general method for reducing tangents to plane curves represented by equations, that the differential calculus was discovered. Considering this theory from a purely mathematical point of view, as connected with the laws of abstract quantity and with quantitative relations; no one can deny its ingenuity, or refuse his tribute of admiration to the genius that invented it. But, if an infinitesimal is to be adopted as a physical reality, competent to determine laws of physical force and physical locomotion; then it is necessary to put in a demurrer, and to test these mathematical concepts by the principles of the supreme science. Judged by such a standard, it will be found that they are wholly unfitted for the solution of physical problems; as will appear from the observations that follow.

An infinitesimal may be interpreted to mean, either a quantity infinitely small in the strict meaning of the term, or a quantity indefinitely small. Whichever way we take it; the difficulties to its becoming a real measure, applicable to physical phenomena, are insuperable.

i. An infinitely small quantity, in the strict sense of the term, is a metaphysical contradiction. It cannot endure as a term of thought. For that which is infinitely small cannot become smaller, without destroying its infinity; unless we are prepared to admit, that the infinite admits of degrees in such wise, that many infinites may be included under one infinite in the same order of being. On the other hand, an infinitely small quantity must be capable of subdivision; because it is quantity and, as continuous, essentially capable of division. Further: An infinitely small quantity is a physical impossibility. For quantity is an accident of bodily substance; and, in consequence, an infinitely small quantity is physically equivalent to an infinitely small body. But no physical body is really capable of infinite division, as has been already explained. Once more: If we assume the doctrine of infinitesimals, as given in the differential calculus; the infinitely small of the first order becomes of necessity finitely small in presence of the second order, that of the second order in presence of the third; and so on for ever. For

there is no assignable limit to the number of the orders. Thus, the same finite quantity would contain within itself an indefinite number of successive and subordinate orders of infinitely small quantities; each at once infinite and finite, according to a mere diversity of relation. Hence, certain inconveniences: First: A part is conceived as utterly disproportioned to the whole; since there can be no entitative proportion between the finite and the infinite. Secondly: An infinite number is introduced, in virtue of an infinite division; yet it is impossible that any multiplication of the finite can result in the infinite. Moreover: A number is absolutely capable of enumeration; consequently, it is essentially finite. Lastly: Any number is capable of addition; and the withholding such addition must limit the number.

ii. An indefinitely small quantity is metaphysically impossible in the real order. For quantity—as has been said before—is essentially an accident of material substance, or body; and is the measure of its extension. If, therefore, any quantity were indefinite; the extension of the body which it informs would be likewise indefinite. But the substantial form is essentially determinative of the accidents that accompany it, and of the body which it informs. Consequently, there could not be a determinate form in bodies, without a determinate quantity. Indeed, a really constituted body with indefinite quantity and extension is simply inconceivable. Again: If an infinitesimal is an indefinitely small quantity, it can admit of no orders. For the lower order, by virtue of the hypothesis, defines the higher; since there can be no relation of proportion between two indefinites. Lastly: Even supposing an indefinitely small quantity to be really and objectively possible, it could never become a measure of physical force or of physical phenomena; because it could have no actual assignable value.

iii. It remains to add one important observation. Neither a force nor motion is quantity. A force is the faculty or power of a material substance, and is included under the Category of Quality. Whatever attributes of Quantity are predicable of it, can be predicated only in virtue of its effect; and are predicable of the effect, only in so far as this latter is mensurable by time or place. Quantity, then, is predicable of force, not univocally, but analogously according to analogy of attribution of the first class. Motion, likewise, because it is an act, comes under the Category of Quality; and it is quantitative, in virtue of the

quantity of the body over which the body in motion passes. Its velocity includes, in addition, the quantitative mensuration of time. It follows, that the quantity of a force is its effect, as mensurable by time and space; and the quantity of motion is the relation of this latter to the same measures. But, as an instant is not time, and an infinitesimal is not real space; neither the one nor the other can measure quantity of force or quantity of motion.

Here we might part company with the difficulty proposed; for it takes for granted that the mathematical theory of infinitesimals is applicable to physical motion, and its demonstration assumes a moment to be capable of measuring motion and the velocity of motion. But,—not to be wanting in respect to such as sincerely believe it to be a solid objection,—the arguments shall be answered in form.

Wherefore, to commence with the first proposition: The *Major*, the *Minor*, and the *Conclusion* may be all granted. But, since there is a declared connection between the two propositions, it will be permitted to distinguish the enunciation itself. *No natural cause can communicate a finite velocity to a body in an infinitesimal unit of time*,—requires distinction. *No natural cause etc.*, because no natural or preternatural cause can *communicate* or cause anything whatsoever *in an infinitesimal unit of time*, since such a unit of time can be nothing real, but simply a mathematical concept,—granted; *no natural cause etc.*, as though *an infinitesimal unit of time* were anything real itself, or capable of becoming the measure of anything real,—denied.

The meaning of the distinction will be plain enough to any one who has carefully read the Prolegomena. No cause finite or infinite is capable of acting or producing, no real effect of any kind is capable of being produced, in an infinitesimal unit of time; whether an infinitesimal unit of time is interpreted to mean, (as M. Sturm defines it), an infinitely small quantity or, as it may otherwise be understood to mean, a quantity indefinitely small. The plain reason is, that in neither sense is an infinitesimal unit of time possible, outside the mind. It is a mere mathematical symbol; and its realization in nature is physically and metaphysically impossible. How it comes to pass that a supposed entity can become a term of thought, whose existence is absolutely impossible, is a question which properly belongs to Ideology. That the foundation of the idea is to be discovered in the meta-

physical truth of the infinite divisibility of the continuous, has been already stated. The same objection presses equally against the term, *infinitesimal velocity*, in connection with anything like physical action.

The demonstration of the second proposition introduces us to a perfectly new question; for it is there seen, that the *infinitesimal unit of time* of the first proposition is interpreted to mean an *indivisible instant* in the second. For in the latter we find it stated, that 'finite velocity cannot be communicated in an indivisible instant, as we have seen' in the first proposition. Therefore, of course, the two are considered identical. But this, as may be seen in the Prolegomena, it is impossible to admit. An instant is not time, but the limit of time; consequently, no portion of time, however small, can constitute a moment, any more than the smallest conceivable portion of a line can constitute a point. It unfortunately follows, as a necessary consequence, that the assumed connection between the two propositions does not exist; and that, for this reason, the minor premiss of this second demonstration must trust exclusively to its own intrinsic evidence. However, as it is undoubtedly an analytical judgment and metaphysically evident; there is no need of pursuing the objection further. Thus two perfectly independent propositions are set before us. We have already shown, that the first does not affect the question in dispute; it now remains to institute an examination of the second. There is one consolation, it may be observed in passing, connected with this last demonstration, which was wanting to the first. We are dealing with something real. There can be no doubt, that instants are realities existing outside of the concept of the mind; just as points exist as the real *termini* of a line. Now, turn we to the proposition. The enunciation,—viz. *in the impact of bodies no communication of finite motion can be made by means of a true and immediate contact of matter with matter*,—is ambiguous, by reason of the last phrase, 'matter with matter.' Since it is intended that the two propositions should have a demonstrative connection; it is unfortunate that this phrase, in a metaphysical discussion, should have been substituted in the second for *body* in the first. If by *matter* is to be understood a group of mathematical points, in accordance with the dynamic theory, the Proposition is granted; because there cannot be any physical contact between mathematical points, or groups of mathematical

points. There is no such thing in nature as an independent point; points only exist actually, as the limits of a line. Even in the hypothesis that such things could exist, they would be quite incapable of becoming the Subjects or Efficient Cause of any physical action; for the simple reason that they cannot be quantitative or extended. Therefore, there can be no communication of finite motion, or of any kind of motion, or of anything else, by *contact* or any other way;—more particularly by contact, which is metaphysically impossible. If, on the other hand, the meaning is, *that in the impact of bodies, no communication of finite motion can be made, by means of a true and immediate contact of body with body;* the proposition is categorically denied. It is with the thesis, taken in this latter sense, that we are exclusively concerned; because the objection could find no legitimate place here, unless it is to be considered as impugning the Scholastic teaching on this question, interpreted by the Scholastic doctrine touching the constituents of material substance. The teaching of Aristotle and of the School does not contemplate matter as a point or congeries of mathematical points, which are centres of forces; and it must leave to such as are factors of the theory the onus of explaining locomotion and physical motion generally, in harmony with their own hypothesis.

Now, to the proof of the proposition: The *Major*,—viz. *that the true and immediate contact of body with body would take place, in the indivisible instant in which the distance between the bodies that are coming into contact becomes* = 0,—needs a distinction: That is to say, the contact of body takes place initially in the said instant,—let it pass; the contact takes place adequately and exclusively in such instant,—denied. We have said *let it pass*, to the first member of the distinction; because (as has been shown in the Prolegomena) an instant can measure neither action nor motion; though there may be admitted to be a sort of correspondence between the limits of the action and the limits of the time that measures it. The *Minor*,—viz. *that finite velocity cannot be communicated in an indivisible instant*,—is granted. No physical motion of any kind and, as a consequence, no velocity whatsoever can be generated in an indivisible instant. *Therefore, there can be no communication of finite velocity by means of a true and immediate contact of body with body*,—is distinguished: That is to say, there can be no generation of motion by means of the

contact taken initially and inadequately, as represented by an instant,—let it pass, or granted; by means of the contact taken adequately as a physical action,—denied. It will be well to explain these distinctions. There must be a moment, as we have seen, which is the *terminus a quo*, or starting-point, of any fixed portion of time. Consequently, as contact of body with body is an action in time; there must be an indivisible instant assignable, which is measure of the initial contact, when the distance between the two bodies is reduced to zero, and motion in the Subject is in its first act. But this initial contact does not represent the adequate contact between the two bodies; because no real bodily contact in the physical order is instantaneous, as will be shown later on. Physical contact is an action, not an act; and action takes place only in time. Further: Velocity, of whatever possible kind, cannot be produced in an indivisible instant. It is metaphysically impossible. For velocity is a property of motion; and motion is continuous. There can, therefore, be no velocity without continuity and succession. Consequently, it can only be measured by time. It is true, that the measure of velocity can be taken at any instant during the course of motion. But how? As a finite portion of time potentially contains an indefinite number of instants, and a line an indefinite number of points; so motion and its velocity contain virtually an indefinite number of rests,—or, as intrinsic terms, perfected changes. (See the Note at the end of the *third* Prolegomenon.) This is strikingly illustrated in the method of Attwood's machine; where rests are produced by artificial means. But a perfected change, or initial rest, is instantaneous. Finally: The distinction of the *Conclusion* is sufficiently obvious. It is granted that motion cannot be produced by the first instantaneous contact of body with body, for the same reason that motion is continuous; though it may be initiated,—that is to say, have its *point de départ*,—by the cessation of previous rest and the first act, or proximate disposition, of motion. It would, therefore, be represented by the act of what is called communication rather than by motion; so that it may be truly said to correspond with an instant of time. But it is denied, that no communication of finite motion can be made by means of a true and immediate contact of body with body, provided that the contact is continuous; and it is maintained that contact of bodies in nature is always continuous.

THE OBJECTION IS URGED:

This continuity of contact between bodies in nature is physically impossible. Therefore, the distinction comes to nothing. The *Antecedent* is thus proved. This continuity of contact is possible, by virtue either of the nature of contact which admits of prolongation, or of the elasticity which is a common property of all bodies. But not by reason of the first; because *a prolonged contact is impossible, unless the velocities have become equal at the very commencement of the contact:* not by reason of the second, because *elasticity is the power of acting after compression, and cannot be exercised till after the action, which works a change on the body, has taken place.* Consequently, in no way is continuity of contact between bodies physically possible.

ANSWER. The *Antecedent* is denied. As touching the proof: In the first place, there is more than sufficient reason for simply denying the *Major*. Not only has no valid proof been given, that the physical contact between bodies is; or can be, instantaneous, whereas from the nature of action it has been demonstrated that such cannot be the case; but there are physical phenomena which afford evidence, at the least *prima facie*, to the contrary. If a stone is moistened, and a marble of sufficient size is allowed to fall upon it; the marble will leave a circular impression upon the stone, of a radius proportional to its size. Now, it is plain from the nature of a circle, that, at the first instant of contact, the marble could have come into contact with the stone, if the latter have a perfectly levelled surface, only at one physical point. Therefore, the impression left must be due to the permanence of the contact in some way or other. In the next place, the division in the *Major* is not exhaustive; and the entire argument is, in consequence, an instance of the *Fallacy of Division*. Wherefore, in form: *Continuity of contact between two bodies is possible by virtue, either of the nature of contact which admits of prolongation, or of the elasticity which is a common property of all bodies,* or of adequate physical contact in its own nature, or of all three combined,—granted; *of prolonged contact, or of elasticity,* separately,—denied.

Now, touching the first member of the *Minor: A prolonged contact is impossible, unless the velocities have become equal at the very commencement of the contact,*—there is need of a distinction: At the indivisible instant, when the action of contact is purely

initial, and motion is in first act,—denied; at the temporal commencement (that is to say, its commencement as measured by time),—a subdistinction is necessary: If no account is made of elasticity, and of a consequent successive impact upon various parts of the extended body,—let it pass; taking into account the natural elasticity of bodies, etc.,—denied.

The above distinctions will receive additional light from an explanation, which will serve at once to evolve the peripatetic and Scholastic doctrine touching this question, and to liberate it from the seeming onus of these mathematical unrealities. The contact of body with body cannot physically be instantaneous; for there is no bodily accidental action, which is not physically continuous and measured by time. Nevertheless, (it may be urged), though the contact cannot be instantaneous, it may be completed in an indefinitely short period of time; to which would correspond, as in a way its function, an indefinitely small intensity of force. But, if the contact is completed in an indefinitely short period of time, how can the motion be accelerated; seeing that prolonged contact is only possible, on the condition that the velocities of the two bodies are equal? At the outset, the Scholastic philosophy scouts the idea, that the contact can be completed in an indefinitely short unit of time; because an indefinitely short period of time can have no existence outside the mind. It is a purely conceptual entity. Physical contact takes place in a definite and appreciable period of time, during which the integral motion is being produced throughout the area of the body that is Subject of impact. Let us revert to the illustration of the marble, falling upon the moistened stone. Part of the impression left may probably be due to the intervening air. Still, making reasonable deduction for such action, it is certain that the circle, left on the stone, is in great measure due to the elasticity of the two bodies; and there is no sufficient reason to doubt, that there is no body which does not possess some amount of elasticity. Now, what is there to be learned from this physical experiment? First of all: The contact could not have been instantaneous; because the marble must have first touched the stone at a physical point, and subsequently come in contact with it along a definite portion of its surface. But such a *before* and *after* could only take place in a definite time. Secondly: The corresponding motion, generated in the

stone, began at one point, and must have been comparatively insignificant; but was afterwards generated over an appreciable portion of its surface. Considering these effects mathematically, as the result of forces acting upon a multitude of points within the given area, it is plain that there would be a resultant equal to the sum of these forces; so that the motion, even if exceedingly small at the first, would become greater in proportion to the extent of the surface in contact. Now, let us introduce a third element. There is no possible doubt about the conductibility of motion. We infer it from such phenomena, as the clean hole made by a bullet through a pane of glass, the snapping in two of a poker by a sharp, quick blow on the muscle of the arm, the cracking of a tumbler suddenly immersed in hot water. The motion, then, generated at the surface, must be propagated throughout the whole body; before the latter can be set in motion. But this requires a certain time; as the experiments, just alluded to, sufficiently prove. Once more: In the instance of the contact of two bodies moving with unequal velocity in the same direction, there is a gradual 'communication' of motion by the quicker to the slower body, till the velocities have become equal. This may be seen in what is called a following stroke on a billiard-board; for, in this case, the object-ball was at rest, previous to the impact of the player's ball. Lastly: Before the commencement of *immediate* contact, an initial motion is communicated to the body, in which the motion is generated, by the action of the intervenient air that acts as instrumental cause of the body that produces motion; as has been noticed in the experiment of the marble and the Subject-stone.

It is a strong extrinsic confirmation of the solution given, that, during the course of centuries, no one has deemed it necessary to admit the dynamic theory touching the constitution of bodies, in order to account for the phenomena of impact; and that, even now, the number is comparatively small of those who defend the necessity of any such admission.

Finally: It would seem as though the objection tells as strongly against the dynamic theory, as it is supposed to tell against the peripatetic teaching. It is taken for granted, that a dynamist will admit his *forces* to be material, and subject to material conditions. In no other sense could he maintain that they, with their mathematical centres, are the constituents of bodies, and

are accountable for all the bodily phenomena perceptible to sense. Further: The objector maintains, that the actual, as distinguished from the actively potential, existence of the force commences with its actual contact, or conjunction with the Subject of its energy. To give every advantage to the dynamist, we will suppose that this cause of motion, (whose energy is supposed to radiate potentially in every direction), impinges at one and the same moment upon any number of points of the body subjected to its action. Since the impact takes place 'in an infinitesimal unit of time,' or an 'indivisible instant; it could not produce any finite motion on any one of the given points. Thus much is taken from the argument of the objecting dynamist. But, according to the same authority, if it cannot produce motion in one; neither can it do so in the instance of any multitude of points. And it stands to reason. For, if the application of the force can have no effect in one case; any multiplication of similar cases could not change the law. If you multiply nothing a millionfold; the product will be *nothing*. This is further confirmed by the phenomena of repulsion, which occur when the velocities of the two bodies, moving in the same direction, are unequal. Either the primitive impact of the one force and the opposite impact of the repelling force take place, each of them, in an indivisible moment of time, or not. If they do not, the motive impact as well as the repelling impact are measured by time, and there is an end of the objection against the immediate contact of bodies; because, from a physical point of view, there can be no sufficient reason for distinguishing, in this respect, between a body in the accustomed meaning of the term, and a force. If the two impacts take place in an indivisible instant; there is no propulsion or repulsion. But let us suppose, for the sake of argument, that the two impacts can produce an effect. In this case, the action of the motive force is arrested by that of the opposite repelling force; so that the action of the former has to begin *de novo*. How, then, is it possible that an increased velocity can be generated in the Subject-body?

II. Unless there were a vacuum, intervening between the body that is Efficient Cause of motion and the body that receives the motion, or—to put it more generally—unless we are prepared to admit the existence of vacua between bodies and the elements of bodies; locomotion would be rendered impossible.

For impenetrability is one of the properties of material substance; consequently, one body cannot, in the order of nature, occupy the same place with another body. Such being the case, if there were no vacuum between bodies, there would be no place to move to; since the whole of space would be occupied. Therefore, every material substance would be hemmed in on all sides by contiguous bodies, and incapacitated from moving out of its own place.

Answer. This objection is older than the time of Aristotle; since the Philosopher quotes, and refutes, it in his *Physics*. After stating the argument, he replies as follows: 'But we affirm, on the strength of what has been already established, that there is but one matter of opposites,—of heat and cold, and of other physical antithesis; and that, from being in potentiality, it becomes being in act; and that the matter is not something separable, though it is distinct in essence from, yet numerically one (if it be so) with, colour and warmth and cold. And the matter of a body, whether it become great or small, is the same. This is plain. For, when *gases* have been generated from water, there was the same matter without addition; only that which it was previously in potentiality, it has become in act' (or actually). 'And, again, water is generated from *gases* in like manner. In the one case, there is a change from smallness to largeness of volume; and, in the other case, from largeness to smallness. In like manner, then, if the air, from being of a considerable volume, should be reduced to a smaller volume, or from a less to a greater; the matter, being in potentiality,' to each, 'becomes the one and the other. For, as that which changes from cold to heat and from heat to cold is the same matter, because it was in potentiality' to one or the other, 'so is it in the change from warmth to greater warmth; nothing having become warm in the matter, which was not warm when the warmth was less. As, then, if the periphery and curvature of the greater circle, whether the same or different, become (if so be) those of a smaller circle, *that* has in no part become curved, which previously was not curved but straight, (for the less and the greater are not the result of loss); and as it is impossible to assume any portion of the flame, in which there is not both heat and light; so is it in the instance of the former heat, relatively to the subsequent heat. Thus, likewise, the greatness and smallness of the perceptible volume is extended without

acquisition, on the part of the matter, of anything additional; but for the reason that the matter is in potentiality to both. So, the same thing is dense and rarefied; yet the matter of both is one. Now, the dense is heavy, and the rarefied light. Further: As, when the periphery of the circle is contracted to a smaller one, that which is contained within the area does not acquire any addition, but that which it was before, is now contracted in volume, and as whatsoever part of the fire one takes, will be warm throughout; so likewise it is, that the whole thing takes place by condensation and rarefaction of the same matter. . . . From what has been said, then, it is plain, that there is no vacuum separated off either simply, or in rarefied bodies, or in potentiality; unless one is determined, in any case, to call the cause of locomotion a vacuum. But in this hypothesis the matter, as such, of that which is heavy and light would be the vacuum; since the density and rarity, in virtue of the above-named antithesis, are effective of locomotion[1].'

With the help of the Commentary of the Angelic Doctor, let us

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[1] *ἡμεῖς δὲ λέγομεν ἐκ τῶν ὑποκειμένων ὅτι ἐστὶν ὕλη μία τῶν ἐναντίων, θερμοῦ καὶ ψυχροῦ καὶ τῶν ἄλλων τῶν φυσικῶν ἐναντιώσεων, καὶ ἐκ δυνάμει ὄντος ἐνεργείᾳ ὂν γίνεται, καὶ οὐ χωριστὴ μὲν ἡ ὕλη, τῷ δ' εἶναι ἕτερον, καὶ μία τῷ ἀριθμῷ, εἰ ἔτυχε, χροιᾶς καὶ θερμοῦ καὶ ψυχροῦ. ἔστι δὲ καὶ σώματος ὕλη καὶ μεγάλου καὶ μικροῦ ἡ αὐτή. δῆλον δέ· ὅταν γὰρ ἐξ ὕδατος ἀὴρ γένηται, ἡ αὐτὴ ὕλη οὐ προσλαβοῦσά τι ἄλλο ἐγένετο, ἀλλ' ὃ ἦν δυνάμει, ἐνεργείᾳ ἐγένετο. καὶ πάλιν ὕδωρ ἐξ ἀέρος ὡσαύτως, ὁτὲ μὲν εἰς μέγεθος ἐκ μικρότητος, ὁτὲ δὲ εἰς μικρότητα ἐκ μεγέθους. ὁμοίως τοίνυν κἂν ἀὴρ πολὺς ὢν ἐν ἐλάττονι γίγνηται ὄγκῳ καὶ ἐξ ἐλάττονος μείζων, ἡ δυνάμει οὖσα γίνεται ὕλη ἄμφω. ὥσπερ γὰρ καὶ ἐκ ψυχροῦ θερμὸν καὶ ἐκ θερμοῦ ψυχρὸν ἡ αὐτή, ὅτι ἦν δυνάμει, οὕτω καὶ ἐκ θερμοῦ μᾶλλον θερμόν, οὐδενὸς γενομένου ἐν τῇ ὕλῃ θερμοῦ, ὃ οὐκ ἦν θερμόν, ὅτε ἧττον ἦν θερμόν. ὥσπερ γε οὐδ' ἡ τοῦ μείζονος κύκλου περιφέρεια καὶ κυρτότης ἐὰν γίνηται ἐλάττονος κύκλου, ἡ αὐτὴ οὖσα ἡ ἄλλη, ἐν οὐθενὶ γέγονε τὸ κυρτὸν ὃ ἦν οὐ κυρτὸν ἀλλ' εὐθύ. οὐ γὰρ τῷ διαλείπειν τὸ ἧττον ἢ τὸ μᾶλλόν ἐστιν· οὐδ' ἔστι τῆς φλογὸς λαβεῖν τι μέγεθος ἐν ᾧ οὐ καὶ θερμότης καὶ λευκότης ἔνεστιν. οὕτω τοίνυν καὶ ἡ πρότερον θερμότης τῇ ὕστερον. ὥστε καὶ τὸ μέγεθος καὶ ἡ μικρότης τοῦ αἰσθητοῦ ὄγκου οὐ προσλαβούσης τι τῆς ὕλης ἐπεκτείνεται, ἀλλ' ὅτι δυνάμει ἐστὶν ἡ ὕλη ἀμφοῖν· ὥστ' ἐστὶ τὸ αὐτὸ πυκνὸν καὶ μανόν, καὶ μία ὕλη αὐτῶν. ἔστι δὲ τὸ μὲν πυκνὸν βαρύ, τὸ δὲ μανὸν κοῦφον. ἔτι ὥσπερ ἡ τοῦ κύκλου περιφέρεια συναγομένη εἰς ἔλαττον οὐκ ἄλλο τι λαμβάνει τὸ κοῖλον, ἀλλ' ὃ ἦν συνήχθη, καὶ τοῦ πυρὸς ὅτι ἂν τις λάβῃ πᾶν ἔσται θερμόν, οὕτω καὶ τὸ πᾶν συναγωγῇ καὶ διαστολῇ τῆς αὐτῆς ὕλης. . . . . ἐκ δὴ τῶν εἰρημένων φανερὸν ὡς οὔτ' ἀποκεκριμένον κενόν ἐστιν οὔθ' ἁπλῶς οὔτ' ἐν τῷ μανῷ οὔτε δυνάμει, εἰ μή τις βούλεται πάντως καλεῖν κενὸν τὸ αἴτιον τοῦ φέρεσθαι. οὕτω δ' ἡ τοῦ βαρέος καὶ κούφου ὕλη, ᾗ τοιαύτη, εἴη ἂν τὸ κενόν· τὸ γὰρ πυκνὸν καὶ τὸ μανὸν κατὰ ταύτην τὴν ἐναντίωσιν φυρᾶς ποιητικά. *Phys. L.* iv, *c.* 9. The term, *gases*, (twice italicized in the above translation, in order to call attention to the liberty taken with the text), has been substituted for *air*, in order that the argument of the passage may be weighed in the light of modern physical discoveries.

institute a careful examination of this passage of Aristotle. The philosophers, whom the Stagirite is refuting, while agreed as to the existence of a vacuum somewhere in the physical universe, differed as to where they should put it. Some of them maintained, that it exists as a sort of envelope of nature; while others were of opinion, that there are vacua, or vacuous pores, within the bodies themselves, and that condensation is the result of the narrowing of these vacua, and rarefaction of their enlargement or dilatation. Some of these latter seemed to have imagined, that by condensation bodies suffered a diminution of matter, and by rarefaction an addition to the matter. They argued, that a vacuum, under one form or another, is of absolute necessity to the possibility of locomotion; and they illustrated their argument by the phenomena of generation and corruption. For, if there is no vacuum, the generated substance must have the same extension as the corrupted substance, in order that the otherwise vacant place of the latter may be filled. But we know, by observation and experiment, that such is not the case; for the generated water has not a hundredth part of the extension which belonged to the corrupted gases. It will appear, on a closer examination of this difficulty, that it may be reduced to the following proposition: The phenomena of rarefaction and condensation require a vacuum. If such were the case, then it would follow that a vacuum is necessary to the possibility of bodily locomotion; if it is not true, then it can be shown that bodily locomotion is possible; even though there should be continuous extension, to the extreme limit of the material universe. Hence, the truth or falseness of the above proposition is the hinge, upon which the whole question may be said to turn. Aristotle preludes his answer, by a recapitulation of four canons, which he has previously established in his first Book of the *Physics*.

i. The first canon is, that contrary accidents appertain to one and the same matter. Thus, for instance, it is the same matter of the water, that is now hot, now cold; the same bread, that at one time is soft, at another time hard; the same iron, which is very ductile when hot, extremely brittle when cold. In a word, the matter of a bodily substance remains the same, under all possible alterations of opposite accidents; just as it is the same matter that is subject to both forms successively, in substantial transformations.

ii. The second canon is, that every material act is evolved out of that entity which was previously in potentiality to such act. The substantial act is evolved out of the potentiality of the matter; the accidental act is evolved out of the potentiality of the integral substance. Thus, for instance, the form of heat in a bar of iron has been evolved out of the potentiality of the iron. The substantial form of the moth has been evolved out of the potentiality of precisely the same matter, which had been previously actuated by the form of the pupa, or chrysalis. Consequently, the Subject—or what may be called the substratum—of the change perseveres identically the same throughout the change.

iii. The third canon—and a most important one it is, in its bearings on the present controversy—declares, that the matter is inseparable from each of these opposite accidents in turn, for so long as it is informed by either of them; although, in its essential entity, it is distinct from both. In other words: We must not consider the accidents of a body, or of a portion of the body, as a covering with which the body is swathed, as in swaddling clothes; so that they can be taken off and put on, as something physically separable from matter. These accidents are the acts of the bodily substance itself; consequently, to imagine the natural separability of the one from the other, is to suppose that an act, in the order of nature, can be severed from the potentiality which it is *hic et nunc* informing. For so long as a rose is red; the red cannot be apart from the rose, or the rose from the red. Yet the matter and substantial entity of the rose are really distinct from its colour; so that they are capable of alteration,—of being actuated by some other colour, in place of the red,—without the slightest diminution or change of any sort in its own essential nature.

iv. The last canon has been already anticipated in the last sentence, explanatory of the previous canon. The substantial Subject remains unalterably the same. This follows from the fact, that primordial matter is the ultimate Subject of all material transmutations; and is, for this very reason, immutable and eternal.

These principles or canons premised, the Philosopher argues as follows: The matter or material substance of opposite accidents belonging to the same body is individually one and the same. But greatness and smallness of volume are contraries in

the Category of Quantity. Therefore, the material substance of a body that is, now greater, now smaller in volume, is one and the same. This conclusion is illustrated by an instance of substantial transformation—that of gases into water. It is experimentally certain, that no subtraction of matter has taken place during the change; for the weight of the water, as modern chemistry assures us, is exactly equal to the combined weight of the oxygen and hydrogen. Yet the difference between the combined volumes of the two gases and the volume of the resultant water is very great indeed. How is this phenomenon explained, according to the Scholastic philosophy? In this wise: The matter, remaining identically the same under the preceding substantial forms of the two gases as under the supervening form of the water, was of itself in potentiality to either size of volume,—capable of either, and successively of both. From the above demonstration Aristotle draws a corollary; that condensation and rarefaction do not take place by any subtraction or addition of matter, but exclusively as the accidental result of a change of quantity. In condensation, the matter is under a smaller volume, by the reduction to act of its previous potentiality to such dimensions; in rarefaction of the same body, the same matter is under a larger volume, by the reduction to act of its previous potentiality to these greater dimensions. It is, however, to be remembered that, since the matter can only exist under the actuation of some substantial form; the condensation and rarefaction—that is to say, the contraction or enlargement of volume—are both subject to a definite limit, in harmony with the specific nature of the substantial form.

From his second and third canons, together, the Philosopher comes to another conclusion,—viz. that the *whole* matter is in act under its accident. This admits of being applied to all accidents, but it has a more special application to quantity; and Aristotle's illustration is taken from quantitative change. It is that of a circle, or circular body, reduced to a smaller size. In such case, as he says, the circumference becomes smaller and the curvature greater; but not in the sense, that some part becomes a curve, which previous to the reduction had been a straight line. It is a question of more or less, throughout the entire circumference. So it is,—to take an instance of an accidental form,—when water becomes warmer and warmer. There

is no part of the water that receives the higher degree of heat, which was not previously informed by the lower degrees of heat.

To revert to the phenomena of condensation and of rarefaction: Condensation is the contraction of the volume of a body; rarefaction, on the contrary, is the enlargement of its volume, the mass of the body remaining the same. A dense body, therefore, is one that includes a great deal of matter under small dimensions; and a rare body is one that contains comparatively little matter under considerable dimensions. It will be seen at once, that rarefaction and condensation, as well as rare and dense bodies *as such*, are formally connected with the accident of quantity; for rarity and density express a sort of transcendental relation of proportion between matter and its quantity,—or rather, between matter and its quantitative dimensions. Now it is necessary to realize the metaphysical truth, that primordial matter of itself is simple, unextended, but in passive potentiality to any whatsoever dimensions. And that which is true of primordial matter in general, is likewise true of each portion of it contained in single bodies; save in so far as the range of this passive potentiality is limited by the specific nature of the substantial form. But, within these limits, each body is capable of a great variety of volume, whether in size or smallness; in virtue of the individuation of the matter.

Thus, then, it is given us to understand that quantity—and, as a consequence, quantitative dimensions—is an accidental act of matter. Quantity gives to matter its extension and partibility. This doctrine is utterly opposed to the erroneous imagination, that quantity is a sort of ideal dice-box, in which molecules and atoms are confined, and the vivacity of their movements retained round one common centre. Nor must it be supposed that this Scholastic and peripatetic doctrine, touching the nature of continuous quantity, is in the slightest degree opposed to the evident physical phenomena of porous bodies. It is not unreasonable to conclude, that Aristotle and the Angelic Doctor were as cognizant of the external structure of a sponge, or other porous body, as the most advanced physicist of the present day; though, in default of our modern microscopes, they were probably ignorant of the all but universal porosity of bodies. But it is plain that such structure belongs to the shape, which is a qualitative mode of quantity; and no more interferes with the

continuity of the quantity itself, than the central hollowness of the links interferes with the continuity of the chain. Yet it must not be forgotten that, according to the teaching of the School, these pores, (wherever they exist), are filled by the surrounding body with which they are in immediate contact.

Two additional remarks remain to be made. The one is, that the density or rarity of a body causes it to be either heavy or light; since weight is a correlative of mass. The other is, that in the case of bodies there are, in general, two agents of condensation and rarefaction,—to wit, evolution from within, and agency from without.

From the preceding explanations the solution of the difficulty may be easily gathered. Locomotion is rendered compossible with the uninterrupted and continuous quantity of the material universe, by the alternate condensation and rarefaction of bodies. Since the matter of each body is in potentiality to a multitude of changes in its quantity; such potentiality may be reduced to act, in this way or that, by the impact of another body. Thus, the air that immediately surrounds the projected cannon-ball is condensed to allow of the ball's transit, and expands again after the ball's passage, in obedience to its normal rarity; and so, instantly and continuously fills up the spaces left by the projectile, as it flies along the path of its trajectory. This, of course, is rendered easier by the great variety of density and rarity of solids, liquids, and gases, according to their respective natures. Though, then, the whole material universe is one unbroken succession of extended matter, continuous from the centre to the periphery of the visible universe; there is nothing to hinder ceaseless motion, within the embrace of its mighty area.

III. The doctrine, advocated in the present Thesis, is diametrically opposed to the theory upon which modern chemistry has been constructed. For, according to this theory, bodies are made up of molecules, and molecules of atoms. Neither are the molecules in contact with each other; nor are the atoms, which compose the molecule, in mutual contact. *À fortiori*, therefore, bodies, supposed to be constituted by the said molecules, cannot come into immediate contact. Consequently, bodies must act upon one another at a distance. Accordingly, it seems necessary, in ultimate analysis, to admit the existence of vacua interspersed throughout the material universe. Yet the theory in question

is commended to our acceptance, by the successful results at which it has arrived. To it modern chemistry owes the vast strides that it has made in comparatively recent times; and that it adequately answers to the phenomena with which it deals, is no slight guarantee of its truth.

Answer. There are two ways of regarding the theory, to which the objection refers. We may consider it, either as an ingenious and serviceable creation of the intellect, adapted to the purposes for which it was devised, (like the differential calculus in mathematics), but purely ideal; or as intended to be a real and proper explanation of the physical constitution of bodies. If it is proposed to us merely as a useful instrument for evolving chemical laws, it does not concern the metaphysician. The chemist is best judge of the fitness of his own tools. But, if it is seriously proposed as a real interpretation of the book of nature; the metaphysician has necessarily something to say about it.

The atomic theory has already been discussed in this Work; once in the difficulties at the end of the *first* Article of the *second* Chapter of this Book, and again in the Appendix to the *first* Section of the *third* Article of the present Chapter, (Note I, n. xii). But the subject is not yet exhausted; and something must be added, in special connection with the present objection. It is of importance to determine, whether the theory, as adopted in modern chemistry, necessarily postulates the existence of vacua and,—as necessarily concomitant,—action at a distance. It must frankly be owned, that it seems to require both; in order at once to defend the isolation of molecules and atoms, and the existence of chemical action. It is true, that there have been physicists who have essayed to fill up the intervening spaces with ether. But the question then recurs, as to the constitution of this ether. Some have maintained that the ether is continuous. If this is admitted, the difficulty is over; the atomic theory, so interpreted, would in no respect differ from the doctrine of the present Thesis. But others maintain, that the constitution of the ether is similar to that of other bodies. But if ether, too, is composed of molecules and atoms; how are the resulting spaces to be filled up? By another fluid? We are under the tyranny of an infinite series, unless ultimately the intervention of a continuous body is granted; and then one cannot see any sufficient reason, why the admission might not have been made at once, in regard of those bodies

whose continuity is attested by the evidence of sensile perception. Mr. Herbert Spencer has some apposite observations in a similar sense. 'But now let us ask,' he writes, 'how much the forwarder we are if an intervening medium be assumed. This ether whose undulations according to the received hypothesis constitute heat and light, and which is the vehicle of gravitation—how is it constituted? We must regard it, in the way that physicists do regard it, as composed of atoms which attract and repel each other—infinitesimal it may be in comparison with those of ordinary matter, but still atoms. And remembering that this ether is imponderable, we are obliged to conclude that the ratio between the interspaces of these atoms and the atoms themselves is incommensurably greater than the like ratio in ponderable matter; else the densities could not be incommensurable. Instead then of a direct action by the Sun upon the Earth without anything intervening, we have to conceive the Sun's action propagated through a medium whose molecules are probably as small relatively to their interspaces as are the Sun and Earth compared with the space between them; we have to conceive these infinitesimal molecules acting on each other through absolutely vacant spaces which are immense in comparison with their own dimensions. How is this conception easier than the other? We still have mentally to represent a body as acting where it is not, and in the absence of anything by which its action may be transferred; and what matters it whether this takes place on a large or a small scale[1]?' If, then, the theory forces us to admit of vacua and of action at a distance, as it seems to do; there is no denying that the objection is so far solid, and that this chemical atomism is irreconcileably opposed to the Scholastic teaching defended in this Proposition. But now remain two questions of the highest moment, which are indicated in the objection; and they are these: Do modern chemists universally accept the atomic theory, as a true and certain account of the constitution of bodies? Is this theory necessary to the chemical laws which are now accepted as certain? We will consider each of these questions separately.

i. It is most consoling to find, that chemical authorities are by no means unanimous in accepting the absolute truth of the

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[1] *First Principles, Part* i, *ch.* ii, § 18.

theory. Mr. J. P. Cooke, Junior, Erving Professor of Chemistry in Harvard University, U. S., after extolling the value of the atomic theory as 'the only one which, as yet, has given an intelligible explanation of the facts of modern chemistry,' goes on, in the following words, to pronounce judgment upon its objective truth: 'I wish . . to declare my belief that the atomic theory, beautiful and consistent as it appears, is only a temporary expedient for representing the facts of chemistry to the mind. Although in the present state of the science it gives absolutely essential aid both to investigation and study, I have the conviction that it is a temporary scaffolding around the imperfect building, which will be removed as soon as its usefulness is past[1].' Professor Miller is not so outspoken as Professor Cooke; nevertheless, the way in which he explains the theory—an explanation which appears only *towards the end* of his Work—assuredly awakens the suspicion, that he regards it only as a serviceable hypothesis. 'Chemists *assume*,' he writes, 'that though every visible fragment of any elementary body admits of further division, there is a limit beyond which this process of *subdivision* cannot be carried by any known method, whether chemical or mechanical. These ultimate or indivisible particles are what are called the *atoms* of the element. No one has ever seen an atom. . . . The atoms of any particular element are further *supposed* to be exactly equal to each other in size and weight. . . . Further, whenever chemical combination takes place between any two chemical elements, it is *assumed* that union occurs between their separate atoms. . . . *These assumptions as to the atomic constitution of matter have been made with a view of explaining the quantitative laws which regulate chemical combination.* This theory of the finite and definite divisibility of matter, or divisibility of matter down to a fixed limit, is in fact the only one hitherto conceived by which union in definite proportion is accounted

[1] *The New Chemistry* (*International Scientific Series*), *Lecture* iv, *in fi.*). This is an unpretending but valuable little book. In the *first* Lecture the learned Professor endeavours to support the atomic theory, by the evidence of certain physical phenomena. This is doubtless a move in the right direction. It would not harmonize with the purpose of this Work, to enter upon an examination of the evidence. It will suffice to make two remarks. The alleged facts admit of, at least, an equally reasonable interpretation, on the basis of Scholastic teaching. Secondly: If we may judge from the passage quoted in the text, Professor Cooke does not seem to attach too much weight to his own inductive conclusions.

for; and if these *suppositions* be admitted, the known laws of chemical combination follow from them as a matter of necessity[1].' Now, there are three observations to be made upon this sober and carefully worded statement of Dr. Miller. (1.) If we take the explanation of an atom, precisely as it has been here given, viz. that it is the ultimate of possible physical division; it has been already shown that such an atom is in perfect harmony with the teaching of the Angelic Doctor, who has expressly admitted the existence of such a limit. An atom, however, in this sense is not so much a constitutive of, as a mechanical derivative from, existing bodies. (2.) In describing the theory, Dr. Miller repeatedly speaks of it as an *assumption* and a *supposition;* which seems to justify the inference, that he agrees with Professor Cooke in considering it to be little more than a convenient hypothesis. (3.) He commends the theory, as Professor Cooke has done, because it is the only one as yet that adequately explains *the quantitative laws which regulate chemical combination.*

ii. Since the atomic theory is treated by chemical authorities, so competent, as a mere serviceable hypothesis; it may perhaps be permitted to one, who cannot claim more than a general and theoretic acquaintance with this most important and interesting branch of physics, to give his reasons for venturing to doubt, whether the theory is, after all, of such practical value as the two Professors pronounce it to be. That the great laws of chemistry have been foreshadowed in the peripatetic and Scholastic philosophy, is the burden of the *first* Note in the Appendix to the *third* Article of this Chapter; and it may possibly be, that the teaching of the School would serve the turn, as well as a theory which is obnoxious to the gravest objections. The question now proposed is, whether this atomic theory is so serviceable as it has been pronounced to be.

It would seem, that there are three foundation-stones on which the science of chemistry reposes. These are affinity, proportion, and the relation of matter to volume. The standard conditions are omitted; because they *are* mere conditions. Now, the laws of affinity, proportion, and relation of matter to volume, have been discovered by experiment and observation, made upon physical

[1] *Introduction to the Study of Inorganic Chemistry* (*Text-Books of Science*), *ch.* x, *n.* 42. The italics for the most part are not in the original.

units of volume, that are perceptible to sense. '*A cubic foot of oxygen weighs sixteen times as much as a cubic foot of hydrogen,*' is an experimental fact. Since it is admitted, that quantified matter is physically divisible up to a definite limit, beyond which division is impossible; there is no doubt that there is such a thing in nature as a physical atom. If, then, the chemist judges that this atom, though out of the reach of experiment, observation, and sense-perception, will serve his purpose better as unit of measure; there is less to complain of. He may change the expression of the above proportion for the following: An atom of oxygen weighs sixteen times as much as an atom of hydrogen. But the atomic theory that is generally adopted goes much further than this. As already said, it does not rest contented with the fact, that a body may be reduced to atoms by division; but it maintains that a body is essentially constituted of separate, non-contiguous molecules, and molecules of separate, non-contiguous atoms. Both molecules and atoms, in this theory, are absolutely beyond the possibility of being perceived by the senses. One authority has fixed the size of a molecule at something between the two hundred and fifty millionth and the five hundred millionth part of an inch; and assures us, besides, that one cubic inch of a gas contains one hundred thousand trillions (100,000,000,000,000,000,000,000) of molecules. But even this is not enough. Each one of these molecules is supposed to be constituted of at least two atoms; and it is one of these atoms, that has been adopted as unit of measure. Now, in his *fifth* Lecture, Professor Cooke has made a very sensible remark, which commends itself to one's common sense. He observes that 'Experimental science, which deals only with legitimate deductions' (inductions?) 'from the facts of observation, has nothing to do with any kind of essences except those which it can see, smell, or taste. It leaves all others to the metaphysicians.' Is it altogether in harmony with this practical declaration, to assume, as the unit of material substance, that which is beyond all possible reach of any of the senses, and is as unapproachable as one of the metaphysical essences that Professor Cooke excludes, and very wisely, from the laboratory? The same question is equally applicable to the unit of weight,—a *microcrith*,—which has no certain *absolute* value; and, in the symbolism of chemistry, is limited to the expression of the specific density of bodies. Again:

These specific gravities were originally obtained by experiment upon some unit of volume and of weight, that is within the reach of sensile perception,—say, a cubic foot, a litre, on the one hand, and a kilogram, or a *crith*[1], or a pound, on the other. When the specific gravities have been thus experimentally determined, they could evidently be transferred to any assignable unit, (real or imaginary,) of volume and of weight; because, as they are nothing but *relative* proportions, they remain the same under any adopted volume or weight. The specific gravity of oxygen is 16; whether you imagine a molecule, or take a litre or *stère*[2] of the gas. It merely represents the *relation* of the weight of oxygen to that of hydrogen taken as the standard; and this relation is invariable. There is, so far, no need of suppositious molecules and atoms; on the contrary, these are obliged to pilfer their values from units of measure, which are subject to experimental observation. *Cui bono* to build on clouds, when you have a solid plot of earth in your possession?

Again: Of the three great laws in chemistry,—those, namely, of Mariotte or Boyle, of Charles, and of Avogadro,—the first two are confessedly independent of the molecular, and of any other theory, and express,—the former, the proportion of the volume of gases to pressure,—the latter, the proportion of the volume of gases to temperature. The law of Avogadro undeniably supposes the truth of the molecular theory; for it declares, that *equal volumes of all substances, when in the state of gas, and under like conditions, contain the same number of molecules.* But it is based upon an experimental law which, in its turn, is independent of any theory, viz. that *in the instance of gases, the space occupied by the combining proportions of a compound is, with very few exceptions,* (which are just as much exceptions to the law of Avogadro), *equal to that occupied by two combining proportions of hydrogen.* How far the doctrine of quantivalence is advantaged by an atomic theory of some sort, it is the province of chemists to determine; but, as at present formulated, it is certainly not free from objections. One of these is suggested

[1] A *crith* is the weight of one *litre* (a little less than an English quart) of hydrogen at the freezing-point. A *microcrith* (see p. 336) is the putative weight of a putative atom of hydrogen, derived in idea and term from the former, which alone is subject to sensile perception and physical experiment.

[2] A cubic metre, the French unit of solid measure.

by a frank avowal of Professor Cooke, that 'there are important exceptions to the general principle, which have never yet been reconciled with the theory[1].' Another is more serious, since it strikes at the root of the system, in its actual expression, as applied to chemical phenomena. It frequently happens in chemical composition, that the quantivalence of one and the same element changes, not only relatively to its combining power with different elements, but even relatively to one and the same component; by reason of which, the nature of the two resultant compounds is sensibly and markedly affected. For instance, carbon in carbonic oxide (CO) enters into combination with oxygen, according to equality of the respective specific weights of the two; in carbonic dioxide, or carbonic acid gas, (CO_2), the proportion of the oxygen is doubled. To translate this fact into modern chemical language: In carbonic oxide you have one atom of carbon and one of oxygen; in carbonic dioxide, one atom of carbon and two of oxygen. Now, according to the doctrine of quantivalence, as interpreted at present in order to square with the atomic theory, carbon is a tetrad,—that is to say, each atom of carbon is imagined to possess four bonds, or clamps; whereas oxygen is a dyad,—that is to say, each atom of oxygen is imagined as bivalent, or possessing two bonds. Accordingly, it is plain that, in carbonic dioxide, the supposed four bonds of the carbon are satisfied by the twice two bonds of the two atoms of oxygen. But what is to be said of the quantivalence in carbonic oxide? Two bonds of the carbon are unsatisfied. The carbon has become virtually a dyad. How is the fact to be explained? We are told in answer, that the two idle bonds *satisfy* or neutralize each other; and this is said to be the result of *latent atomicity*, whatever that may mean. Take another more telling example: Nitrogen is a triad,—that is to say, its atom is trivalent, or possessing three bonds; oxygen (as has been said) has two bonds. Now, let us pass in review various combinations of these two elements. In nitrous oxide (N_2O), four of the bonds of nitrogen are unsatisfied; in nitric oxide (N_2O_2), two are unsatisfied; in nitrous anhydride (N_2O_3) there is equivalence; in nitrogen peroxide (N_2O_4) two bonds of the oxygen are unsatisfied by the nitrogen; and in nitric anhydride (N_2O_5)

[1] *The New Chemistry, Lecture* xi, *p.* 248.

four bonds of the oxygen. Wherefore, in the first compound nitrogen is *practically* univalent; in the second, bivalent; in the third, trivalent; in the fourth, quadrivalent; in the fifth, quinquivalent. But the atomic theory postulates, that each elementary atom should have its determinate number of bonds; so this supplementary contrivance of the mutual satisfaction of bonds existing in the same atom has been introduced, in order to remove the difficulty. But is not this a somewhat clumsy hypothesis? Yet, apart from the intrusion of the said theory, what more easy to understand, than the possible combination of any two elements in different proportions? It cannot be denied that the theory of quantivalence, even as interpreted to us by modern chemists, has a completeness and order that is very fascinating; and there seems but little doubt that it is following up a right track. As Professor Cooke puts it: 'Our whole atomic theory may pass, the words molecule and atom may be forgotten; but it will never cease to be true that the magnitude which we now call a molecule of water consists of two of the magnitudes which, in the year 1872, were called atoms of hydrogen, and of one of the magnitudes which were called, at the same period, atoms of oxygen[1].' We cannot accept the Professor's method of expression; for neither the molecule nor the atom, (so called in 1872), has or can have any defined physical magnitude, and it cannot be admitted that water *consists* of oxygen and hydrogen. But the implied truth will remain to the end of time, that, towards the evolution of the new substance of water, hydrogen and oxygen must enter into combination in the proportion of two to one. All beyond this, on either side, will be surplusage.

To the same cause is attributable the unsatisfactory explanation of the phenomena of isomerism. It is found that utterly different substances, to all appearance have exactly the same chemical composition and vapour density. Thus,—to borrow Professor Cooke's striking illustration from organic chemistry,—butyric acid and acetic ether are both represented by the same symbol, $C_4 H_8 O_2$; and both have the same specific gravity. Yet,—not to mention other marked differences,—butyric acid is that which gives the disagreeable smell to rancid butter; while acetic ether reveals its presence in the refreshing smell of an

[1] *The New Chemistry, Lecture* xi, *at the commencement.*

apple. How is this specific difference between the two substances explained? The three component elements and the relative proportions between them being precisely the same; it is assumed, that there is a different distribution of the atoms, and a consequent change in the structure of the elements. Can it be seriously held, that qualities so different, and substances so distinct, owe their entire differentiation to a mere change of relative position in the same constituents? This far surpasses the ingenuity of the performer, who turns one side to his audience and assumes the man; and, turning to the other side, becomes a woman. Surely, it would be safer to confess one's ignorance, and wait; rather than rest contented with such an explanation.

Once more: It is obviously owing to the influence of the atomic theory in the reconstruction of modern chemistry, that 'unfortunately for the simplicity of our system[1]'—such is the frank confession of Professor Cooke,—the specific weights of the simple bodies, *already experimentally established*, have to be doubled; so that, for instance, the specific weight of oxygen, which is really 16, now reads as 32. Why? Hydrogen has been, reasonably enough, selected as the standard of weight. But the *molecule* of hydrogen is imagined to consist of two atoms; and, though the weight is professedly molecular, the selected unit is a half-molecule.

There is one more preliminary remark to be added. The symbols at present in use are as intelligible and as valid, if referred to units of measure that are subject to the perception of sense, as they are when interpreted of, what Professor Cooke terms, 'supersensuous' units.

With the help of these previous observations, it will be easy to solve the difficulty proposed. The actual success of chemical investigations under the atomic theory is no sure proof of the truth of the theory; for it remains to be established, that the same painstaking zeal and capacity would not have made equal, and perhaps greater, advances under the guidance of a more rational theory. The atomic theory has no direct physical evi-

[1] 'Unfortunately, however, for the simplicity of our system, but for reasons which will soon appear, it has been decided to adopt as our unit of molecular weight not the whole hydrogen-molecule, but the half-molecule. . . . . Had we selected the whole of a hydrogen-molecule as our unit, then the number expressing the specific gravity of a gas would also express its molecular weight; but . . . we use for the molecular weights a set of numbers twice as large as they would be on what might seem, at first sight, the simpler assumption.' *The New Chemistry, Lecture* iii, *towards the middle.*

dence in its favour; indeed, it cannot have. It can, therefore, claim no force of inference, against the rigid conclusions of the metaphysical science. This argument is considerably strengthened by the fact, that distinguished chemists consider the truth of the atomic theory to be anything but free from doubt; and only adopt it as a temporary expedient, the best fitted to their present need. A further confirmation is to be found in the fact, that the influence of this theory on modern chemistry has led to apparent anomalies and inconveniences in the system, on the basis of which the science has been constructed, which are distinctly traceable to it as to their source; and that the substantial truths, which have been so successfully developed by the labours of modern chemists, would remain unimpaired, should the atomic theory prove false, and the teaching of the School assume its place. It may safely, then, be doubted whether modern chemistry does owe its successes to the influence of this theory; and it is categorically denied, that the fact—even if established—of its adequately answering to the known chemical phenomena with which it deals, is a necessary or certain guarantee of its truth.

IV. This, and the remaining difficulties are opposed to the *à posteriori* demonstrations of the Proposition. Mr. Browne, in a paper on *Action at a Distance* (to which reference has been already made), has proposed the following difficulty. 'If action at a distance does not exist, then the only *direct* way in which one body (A) can act upon another (B) is by coming into absolute contact with it; and the only *indirect* ways in which it can act upon it are two, viz. either by projecting a third body from contact with itself into contact with B, or by diverting some third body which, if not diverted, would have come into contact with B. If action at a distance does not exist, all the actions between all the bodies of the universe must be explicable, by impact, on one of these three hypotheses. If any phenomenon takes place which cannot be so explained, then action at a distance does exist. It may be added that, if it is shown to exist in any one instance and at any distance, there is no probability against its existence in any other instance and at any other distance[1].' But there are actions in the universe, which

[1] *Proceedings of the Physical Society of London, January to April*, 1881, *n.* xiii, *on Action at a Distance.* By Walter R. Browne, M.A., M. Inst. C. E., late Fellow of Trinity College, Cambridge.

no one of these hypotheses can account for. Therefore, action at a distance exists.

The *Minor* is proved by examples. There are many actions, such as gravity, magnetism, etc., which cannot be explained, on the hypothesis of absolute contact between the body (A) and the body (B). 'In fact,' so says Mr. Browne, 'it will be granted that in these and many other cases there is an *apparent* action between bodies at a distance.' Secondly, cases of attraction cannot be explained by the hypothesis, that A projects a third body from contact with itself into contact with B. The third hypothesis is beset with apparently insuperable difficulties, and is encumbered with a large number of arbitrary assumptions. There is a further confirmation of the *Minor*, by fresh examples given in another part of the paper. Cohesion,—for instance,—the extension and contraction of a bar of iron or steel, the attraction of a magnet, the vibration of a molecule about a central position, (which is the fundamental idea in explaining heat, light, and all undulatory movements), cannot be explained on any one of the hypotheses above mentioned.

Answer. There are one or two preliminary observations, that will assist towards a clear understanding of the solution of this difficulty.

i. Mr. Browne has given his definition of what he means by *action at a distance*. By this term is meant, 'that direct action takes place between two bodies, separated from each other by a finite distance, without the intervention of any body whatever.' There are two faults to find with this definition. The word, *finite*, is redundant; because any real distance determined by two bodies must be finite. The final clause may either mean the *causal* intervention of any body whatever, and then it is redundant, because already included in the word, *direct;* or it may mean simple local intervention, and then it would unduly limit the concept of action at a distance. It would perhaps be better to rest contented with the remaining words. Action at a distance, then, means, that *direct action takes place between two bodies separated from each other*. The possibility of one body acting upon another, when a third body intervenes which is not a causal instrument of the principal agent, will be considered in the next Proposition.

ii. Mr. Browne has assumed, throughout his paper, the truth

of the atomic theory. Having regard to the audience before which the paper was read, it is quite possible that his contention was intended to have its value, as purely an *argumentum ad hominem;* but, estimated at its absolute worth, at the most it comes to this, either that the atomic theory must be abandoned as untenable, or that the possibility of action at a distance must be admitted. Thus understood, we are presented with an alternative; and no disciple of the School would find any difficulty about his choice.

iii. The first proof which Mr. Browne affords of his *Minor* is a transparent fallacy of division. By a similar syllogism it could be demonstrated, that there is not a man living on the earth. Thus: If there be a man living, he must have been born, either in Europe, or in Asia, or in Africa, or in America, etc. But the Chinese have not been born in Europe; the Scotch have not been born in Asia; the Peruvians have not been born in Africa; or the Greeks in America; etc. Therefore, etc. Accordingly, we may ignore the first proof, and limit ourselves to the second.

iv. It may at once be admitted that, 'if action at a distance is shown to exist in any one instance and at any distance,' there is no reason why it should not exist in other instances and at other distances. On the contrary, the probability is, that such would be the case.

Let us now examine the main argument of Mr. Browne. The *Major*,—viz. that *if action at a distance does not exist, then the only direct way in which one body can act upon another, is by coming into absolute contact with it; and the only indirect ways in which it can act upon it are two, viz. either by projecting a third body from the contact with the one to contact with the other, or by diverting some third body which, if not diverted, would have come into contact with the other*,—is distinguished: The first Member of the conditional,—viz. if action at a distance does not exist, the only direct way, etc., is by coming into absolute contact with it,—granted; the second Member touching the indirect ways,—denied. As to the *Minor*,—viz. there are bodily actions in the universe which no one of these hypotheses can explain,—it may be granted. The *Conclusion* is denied, by virtue of the distinction made in the *Major*.

The above distinctions need explaining. It is categorically

denied, that the two indirect ways, mentioned in the second Member of the *Major*, are the only possible methods by which one body can act mediately upon another. Indeed, it is more than doubtful, whether either of them represents any mediate action at all of body upon body. We take leave to substitute the terms, *immediate* and *mediate* for the *direct* and *indirect*, adopted by Mr. Browne; because the former are less ambiguous. The aforesaid hypotheses exclusively cover cases of immediate action. For, when a bodily agent projects a body, that was in immediate contact with itself, towards another body with which the intermediate, in turn, comes into immediate contact; there are two actions entitatively distinct,—to wit, the action of the agent upon the first body, and the action of this on the second. But both are instances of immediate action. Thus,—to illustrate by an example,—if a ball is discharged from a cannon, and breaks through an iron plate; there are two distinct actions. First of all, the compressed gas generates motion in the cannon-ball. Then, the cannon-ball, by virtue of its own acquired motion, produces its effect on the trial-plate. But the compressed gas is in apparent contact with the ball; and the ball, in turn, is in contact with the plate at the moment of impact. Thus the first hypothesis of Mr. Browne embraces no mediate action. The possibility of the locomotion of the ball has been already explained under a previous difficulty. It will be found, on a careful examination of Mr. Browne's obscure explanation of his second hypothesis, that this latter is precisely parallel with the former.

The second assertion is that, even supposing these two hypotheses to be capable of representing mediate action of bodies, they are not the only possible ways in which one body can act mediately on another. They each include the idea, in one way or another, of an intermediate, moving from agent to Subject, simultaneously connected with neither, but only successively; whereas a body so acts mediately on another body, as that the medium, or intervening body, shall be in immediate contact with the two, according to the explanation already given. Such mediate action may be either immediate or mediate in its causality;—that is to say, the agent may act immediately through and in the instrument, as in the water that passes through a pipe, or it may communicate virtue to the instrument,

by virtue of which this latter formally produces the effect, as in the action of the human will on the locomotive forces of the body. In the former class of mediate actions, there is that which requires notice; for there seems to be something like a contradiction involved. The action, which is really the effect, is at once mediate and immediate. How can this be? The explanation is, that the agent-body immediately conspires with the virtue of the instrumental cause, so that the causality of the former directly reaches the effect; but it is mediate in regard of direction and, more particularly, of substantial or suppositive presence. In a word, the corporal agent is present with the Subject of its action vicariously.

It now only remains to consider the instances, alleged by Mr. Browne in the second proof of his *Minor*. These are three; viz. magnetic attraction, contraction and extension of the volume of bodies, and molecular vibrations. Of these the last may be at once set aside; since it is not a fact of experience, but the outcome of a theory which has been here rejected. The first, by reason of its importance, will be considered by itself. The second has been answered by anticipation. The compression or contraction of a body is nothing but the accidental actuation of the same material substance, now by one volume, now by another. In like manner, the extension or dilatation of a body is simply a change in its accidental extension. The ubication of a body—that is to say, its definite position, actual or aptitudinal, in space—is a mode of its extension; and impenetrability is a property of bodies, consequent on their extension and ubication. For impenetrability is an accidental quality, by which bodies and parts of bodies naturally exclude any other bodies, or parts of bodies, from that portion of space which they occupy themselves. It follows that, with a change of quantity or extension, there will be a corresponding change of ubication; and, in the contraction of a body, the deserted space will be filled by the dilatation of the contiguous body or bodies, while, in the dilatation of a body, the space required will be afforded by the corresponding contraction of the contiguous body or bodies.

V. One of the favourite arguments, which has for centuries been brought forward in proof of the action of one body on another at a distance, is derived from the phenomena of magnetism. Appeal has been made to the testimony of the senses;

and the challenge is accepted. The needle is separated, by a considerable interval of space, from the magnet; yet the latter manifestly acts upon the former, and causes it to change its place. Similar phenomena occur, as might have been expected, in electricity. There are few who have not seen the little pith figures, dancing up and down between the electrified plates. If we turn our attention to other cognate phenomena; the same facts confront us. In animal magnetism there are certain experimental results, about which there can be no reasonable doubt; unless we are prepared to extend our scepticism to all physical induction, evidence of the senses, and human testimony. Among these is the coma, or magnetic sleep, into which a patient is thrown by the passes of the operator. Now, in this experiment the effect may be produced, as the writer has seen it produced, when agent and Subject are at an appreciable distance from each other; and, unless we mistake, the magnetizer seldom, if ever, allows his hands to come into contact with the body of the person being magnetized[1]. To these may be added the well-known phenomena of, that which commonly goes by the name of, fascination. The following instances are borrowed from Mr. Thompson's Work on the *Passions of Animals*. 'Mr. Pennant says, that this snake (the rattle-snake) will frequently lie at the bottom

[1] The phenomena of mesmerism were not unknown to the men of earlier times. There is a curious instance, recorded by St. Augustine, which agrees, in all but the method of producing the state of coma, with those of cases recorded in our own time, and witnessed by many of us. This is the story he tells: 'Jam illud multo est incredibilius, quod *plerique fratres memoria recentissima experti sunt.* Presbyter fuit quidam nomine Restitutus, in paroecia Calamensis ecclesiae, qui quando ei placebat, rogabatur autem ut hoc faceret ab eis qui rem mutabilem (memorabilem?) coram scire cupiebant, ad imitatas quasi lamentantis cujuslibet hominis voces, ita se auferebat a sensibus, et jacebat simillimus mortuo, ut non solum vellicantes atque pungentes minime sentiret, sed aliquando igne ureretur admoto, sine ullo doloris sensu, nisi postmodum ex vulnere, non autem obtinendo (using any effort) sed non sentiendo non movere corpus, eo probabatur, quod tanquam in defuncto nullus inveniebatur anhelitus; hominum tamen voces, si clarius loquerentur, tanquam de longinquo se audire postea referebat.' (*De Civitate Dei, L.* xiv. *c.* 24.) In this instance, the proximate cause is stated to have been the plaintive tones of the human voice. There are doubtless few persons who have not witnessed the effects of such sounds, especially proceeding from the human voice, on animals of a markedly sensitive organism. That the supposed *odylic* force should proceed from the mouth, affords no occasion for reasonable surprise. As to the apparent stoppage of respiration, the present writer witnessed the same phenomenon, in the case of a mesmeric trance at Perth in the year 1852. There was this difference, however; that, in the latter instance, the breathing seemed to come from the pit of the stomach. The operator was a physician then resident in that town.

of a tree on which a squirrel is seated. He fixes his eyes on the animal, and from that moment he cannot escape; it begins a doleful outcry, which is so well known that a passer-by, on hearing it, immediately knows that a snake is present. The squirrel runs up the tree a little way, comes down again, then goes up and afterwards comes still lower. The snake continues at the bottom of the tree, with its eyes fixed on the squirrel, and his attention is so entirely taken up, that a person accidentally approaching may make a considerable noise, without so much as the snake's turning about. The squirrel comes lower, and at last leaps down to the snake, whose mouth is already distended for its reception. Le Vaillant confirms this fascinating terror by a scene he witnessed. He saw on the branch of a tree a species of shrike' (a dentirostral bird of the sparrow-order) 'trembling as if in convulsions, and at the distance of nearly four feet, on another branch, a large species of snake, that was lying with outstretched neck and fiery eyes, gazing steadily at the poor animal. The agony of the bird was so great that it was deprived of the power of moving away, and when one of the party killed the snake, it' (i.e. the bird) 'was found dead upon the spot—and that entirely from fear—for, on examination, it appeared not to have received the slightest wound. The same traveller adds, that a short time afterwards he observed a small mouse in similar agonizing convulsions, about two yards from a snake, whose eyes were intently fixed upon it; and on frightening away the reptile, and taking up the mouse, it expired in his hand[1].' The compiler of these interesting zoological anecdotes attributes the facts narrated, exclusively to the influence of an instinctive terror of the serpent. But this is hardly an adequate explanation. There is no doubt that the poor victim is struck with terror. But what is it that strikes terror? It is not the serpent, *as* serpent. So much seems evident from the following fact, of which the author was an eye-witness. A boa-constrictor in the Regent's Park Zoological Gardens was being fed. The reptile had but recently seized one rabbit, and was apparently engaged in the process of deglutition; for the little thing's pats were still sticking out of the monster's mouth. During all this time, another rabbit was in the cage, sometimes running across

[1] *Section on Fear.*

its enemy with seeming unconcern, and even licking it. At last the snake reared itself, and fixed the little victim with its eye. Then, and not till then, the rabbit remained paralyzed in a corner, and was soon seized and devoured. This anecdote points to the conclusion, that there is something in the eye of a serpent which fascinates its prey; and Mr. Pennant's account is strikingly confirmatory. For, according to him, the rattle-snake is with great difficulty diverted from its gaze; which seems to indicate an instinctive apprehension, lest a momentary aversion of the eyes should favour the escape of its prize. Whatever may be the reader's opinion touching the cause of this fascination, this at least is undeniable; that the agent is not in immediate contact with the Subject. Nearly allied to this, is another class of phenomena, which prudence requires that we should introduce with a preface, because of the superstitious exaggerations by which it has been surrounded. The belief of mankind in the existence of the *evil eye* has been so general and so constant, as to render it highly improbable that it is entirely destitute of foundation. Aristotle refers to it, as to an established conviction in his time; though he seems to think that, in the majority of cases, it is the result of excessive eating and consequent dyspepsy[1]. Theocritus tells of a somewhat distasteful charm against the evil eye, which had been taught him by a witch[2]. Virgil, in his third Eclogue, makes his Menalcas complain, that an evil eye had been on his fatless young lambs[3]. Pliny goes into considerable detail concerning these fascinations, as he terms them; and, in particular, mentions the evil eye, which is especially baneful when inflamed with anger[4]. There is every reason to conclude, that the belief in the evil eye was general in Greece and Italy and, one may say, in most parts of the ancient world. To this day it is widely spread among different peoples of Europe, including the Irish and Scotch. Whether or not there may have been anything preternatural connected, at any time, with this particular kind of

[1] ἢ διότι βασκαίνεσθαι δοκοῦσι λάβρως ἐσθίοντες. *Probl. L.* x. *pr.* 34.

[2] ὡς μὴ βασκανθῶ δέ, τρὶς εἰς ἐμὸν ἔπτυσα κόλπον,
ταῦτα γὰρ ἁ γραία με Κοτύτταρις ἐξεδίδασκεν. *Id.* vi, 39.

[3] 'His certo neque amor causa est; vix ossibus haerent.
Nescio quis teneros oculus mihi fascinat agnos.' *Ecl.* iii, *ll.* 102, 103.

[4] 'Esse ejusdem generis in Triballis et Illyriis, adjicit Isogonus, qui visu quoque effascinent, interimantque quos diutius intueantur, iratis praecipue oculis.' *Nat. Hist. L.* vii, *c.* 2.

fascination, is not a question to be ventilated in these pages. What is here maintained is this: If it should appear, that there exists in some men a *natural* power of fascination, similar to that possessed by serpents; it is plain that they can, and do, exercise such action at a distance from the Subject of their influence. If, then, there are so many instances in which our senses bear witness to the fact, that action at a distance does really take place; no argument, based on sensile perception, can be of avail to show the necessity of immediate contact, to the immediate action of body on body.

Answer. To prelude the solution with a remark or two touching the evil eye: In searching to discover some natural foundation for the popular superstition, thus much we find by experience; that there are some men who have a special power in their eyes over their own kind, as well as over animals. Its possession would seem to be a necessary qualification with tamers and subduers of wild animals. It has been currently reported of some men,—as, for instance, of Lord Chatham and of Mr. David Urquhart,—that they possessed this eye-power over their fellows in a remarkable degree. There is another curious instance, open to common observation, which confirms the previous conclusion. It is rare that one can fix his regard upon another for any length of time, without noticing that the person, so regarded, at length becomes uneasy, and instinctively looks up to meet the glance, even though he may have to turn his head in order to do so. May it not, then, possibly be true, that there is a material force,—similar in its nature to magnetism and galvanism,—by which one living body exercises attraction or repulsion (as the case may be) on another living body? In connection with this problem, it is impossible not to refer to the *Researches on Magnetism, etc., in their relations to the vital force*, by Baron Von Reichenbach, which was some time ago translated from the German by Dr. Gregory, then Professor of Chemistry in the University of Edinburgh. This Work is most interesting, as an excellent instance of careful induction; but it is especially valuable, for the light it throws on the present inquiry. By experiments and observations carried on for years, this eminent German Doctor of physics arrived at certain conclusions which, in not a few instances, were confirmed by the independent experience and testimony of Dr. Gregory. The result of his labours has been,

to establish the existence of what he terms an *odylic* force pervading the whole material universe, of which certain forces belonging to the magnet, to crystals, to animals, etc., are modifications. It is, however, with his discoveries in animal magnetism, that we are specially concerned. Of this force he concludes, that it 'has the property of conductibility through all bodies, and of communicability to all bodies, by direct charging, or by induction; of soon disappearing from them; of being retained in them for a short time by their coercitive power;—it is polar in the human body, in virtue of its dualism; has no perceptible relation to terrestrial magnetism; exerts a mechanical attraction on the hands of cataleptic patients; and is associated with luminous phenomena,—all exactly as the crystalline force is.' There is one clause, in the above statement of Baron Von Reichenbach, which seems to disconnect this odylic force with terrestrial magnetism. It is apparent, however, that, in saying this, the learned Professor was referring to phenomena and properties which had formed the special subject of his experiments; for he expressly subjoins: 'These three forces, in their essence, when regarded from a common point of view, coincide, or are identical[1].' It is evident, then, that, in his judgment, the properties he has enumerated do not cover all the known phenomena of animal magnetism; while it is natural to conclude, that a force, flowing from a living substantial form as from its source, would be of a much higher order than one, however similar in many of its characteristics, which proceeds from inanimate substances.

As the theory of Baron Von Reichenbach has been fiercely attacked, in Germany more particularly; it would be rash to rank it, as yet, among those theories which have been more or less universally accepted by physicists. But thus much may be safely said. The careful inductions of this German Professor seem, in the absence of other evidence, to justify the conclusion, that there exists in animals, but more particularly in man, a real force by which body acts on body, (apparently energizing through eyes and hands, as its more special organs), with a polarization of its own, and manifesting its presence to the sensitive by certain luminous phenomena. They further lead to the conclusion, that the phenomena of animal magnetism,—in

[1] *P.* i, *tr.* iv, *n.* 95, *h.*

which should be included those of animal fascination—are subject to the same laws as, and are nearly allied to, the phenomena of magnetism, galvanism, and electricity[1]. Thus, in any case, the solution of the present difficulty is rendered more simple; since it is obvious, that one and the same answer will cover all the instances alleged in the objection. The solution is as follows: In every case, the agent is mediately contiguous with the Subject,—that is to say, both agent and Subject are in immediate contact with the same intervening body and, through this latter, with one another. Consequently, there is here no action at a distance. This is no gratuitous assertion; seeing that it is supported by abundant evidence, derived from various electrical phenomena. One proof is derived from the phenomena of conduction, as already explained in connection with this question. Another proof is afforded by the electric spark; for, whatever may be the medium of which the force serves itself, its action is distinctly traceable from agent to Subject, by the excandescence of the intervening air, and by the partial ozonizing of the oxygen perceptible by the smell. It is further proved, as already pointed out, by the limitation of distance; as well as by the relation of proportion between the distance and the strength of the electric charge. The electrical experiment, introduced into the objection, really affords the strongest proof

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[1] An interesting discussion appeared in *Nature* (June to July, 1881), touching what is there named *thought-reading*, in connection with certain unusual powers exhibited by a Mr. Bishop. When it appears, that the phenomena were declared, by no less an authority than Dr. Carpenter, to be deserving of examination by 'scientific' men; we may conclude that they are beyond the reach of reasonable suspicion. It would appear that Mr. Bishop possesses the faculty of discovering hidden objects, by contact with the hand of the person who has hidden them. May not the theory of Baron von Reichenbach tend to throw light on these manifestations? If we interpret the alleged facts by the light of his inferences, the hidden articles, by continued contact with the hand of the hiders of them, would become charged with 'odyle'; and the longer the hidden object was retained in the hand, the more powerful the storage. If Mr. Bishop, as seems probable, should be peculiarly sensitive to the action of this fluid, by aid of the hand that (so to say) charged the object and acts upon his own body; it would be easy for him to be guided towards it. This would in like manner account for the fact, recorded by Mr. Romanes, viz. that 'it was soon found that he succeeded much better with some of us, than with others'; since the success of the experiments would naturally vary with the degree of odylic power in the particular hider. It must strike every one, that the term selected to express these phenomena is most inappropriate and misleading.

of the truth of the present Proposition. For, whereas the phenomenon of original attraction towards the upper plate is satisfied by the considerations just offered; there is a further phenomenon, which requires the *immediate* contact of the two bodies. It is only by contact with the upper plate, that the pith balls or figures are charged with positive electricity and, as a consequence, are repelled to the lower plate; and it is only by contact with the lower plate, that they become in turn negatively electrified, and are repelled again towards the upper plate.

PROPOSITION CCLXVIII.

One body cannot act immediately upon another body, when a third body intervenes between the two.

The following is the Proof:

Either the intervening body is a medium by which the agent acts upon its Subject, or it is not. In the former case, the action is not immediate; in the latter case, action is impossible. Therefore, etc. The first Member of the *Minor* is evident; the second Member is thus declared. In the preceding Thesis it has been shown that, by reason of its essential imperfection, a material form cannot energize beyond the limits of the body which it informs. Further: It is a necessary consequence of the mutual impenetrability of bodies, that the agent-body could not, by any dilatation of its extension, reach its Subject; so long as the intervening body remained between them. The case, therefore, is identical with that of an intervening vacuum; save that the former is physically possible, while the latter is not.

Corollary.

It follows from this and the previous Propositions, that, whenever one body is separated from another by an intervening medium, the former cannot exercise any causal action on the latter, unless it can act upon the *entire* intervening medium; so that the action is carried on (so to say) continuously to the distant Subject.

DIFFICULTIES.

I. The present Proposition is in open opposition to known astronomical phenomena. When an eclipse of the sun takes place, the attractive action of the sun upon the earth is not sensibly increased or diminished. But, unless the sun acts immediately on the earth, when the moon comes between the two; its action must be sensibly either increased or diminished. Therefore, etc. The *Minor* is thus proved. If the moon functions as a medium of the sun's attraction, the attractive force of this latter would be increased by the addition of the moon's proper attraction; if the moon, on the other hand, were a body simply interposed, the sun's action would suffer diminution to the extent of the moon's obstruction, as in the parallel phenomena of light and heat.

ANSWER. The *Antecedent* is denied. As to the proof: Let the *Major* pass. The *Minor* is denied. As to the proof of the *Minor:* The first member of the *Antecedent* must be distinguished: *If the moon functions as a medium of the sun's attraction; the attractive force of the sun would be increased, by the addition of the moon's proper attraction*, supposing the moon to be not only medium, in the strict meaning of the term, but likewise concause of precisely one and the same effect,—granted; *if the moon functions as a medium* in the strict meaning of the term, —a subdistinction is necessary: *The attractive force of the sun would* in itself, as causal action of the sun, *be increased*,—denied; terminatively,—there is need of a further subdistinction: It would be terminatively increased, in relation to its own proper effect,—denied; in relation to a composite effect, of which with the moon it was joint cause,—granted. The second member must also be distinguished: *If the moon were a body simply interposed, the sun's action would suffer diminution to the extent of the moon's obstruction, as in the parallel phenomena of light and heat*, if the moon is impeditive of the action of the medium, as in the instances of light and heat,—granted; if it is not impeditive of the action of the medium,—denied.

To explain the above distinctions: There are two ways, in which an entity may be the medium or instrument of the agent. Either it may serve simply as a channel (so to speak) for transmitting the causal action of the principal agent, or it may actively (though subordinately) co-operate with the principal

agent towards the production of the effect. To take an instance of each: It is quite plain that the stick, with which a man removes a stone from his path, does not contribute, by any motion of its own, towards the removal of the stone; neither does it add to the original human force that it transmits. On the other hand, water, in virtue of the law of equality of pressure exercised by liquids in all directions, can multiply the force exerted on a portion of its surface; as is seen in the action of the hydraulic press. In the former case, one can plainly see that the force of the principal cause would not be increased by its conjunction with the medium; in the latter case, it as plainly would. But it might so happen, that the medium, though simply a medium in relation to the causality of the principal agent, should have an independent causality of its own,—a causality, moreover, akin to that of the principal agent. Thus, in the not impossible hypothesis that, in the phenomenon of a solar eclipse, the moon is a partial medium of the sun's attractive action on the earth, independently of the sun it would exercise its own attractive power on the earth; and thus a compound result would be produced, such as may be seen in the phenomenon of neap-tides. But, even on such a supposition, the attractive force of the sun, of itself, would not be increased, —that is to say, the actual force (as proceeding from the sun exclusively) would remain unchanged; though it would be increased *terminatively*,—that is to say, it would be terminated to a result greater than that which it could of itself produce,— because the result would be greater, through addition of the result produced by the moon.

But there is another hypothesis, which would seem to be more in favour with modern physicists; viz. that the moon is not, in any sense, a medium of the sun's attractive force in the phenomenon of a solar eclipse. Let us suppose, for the sake of thoroughly probing the difficulty, that this is true. In such case, the moon would be simply a body interposed between the sun and the earth. It behoves those, then, who maintain (as we here maintain) that action at a distance is impossible, to explain why, in a solar eclipse, the light and heat from the sun suffer diminution, while its attractive force appears to remain unaffected. To put the same difficulty in another way: Since the sun itself is evidently at a distance from the earth; if it does

not act upon the latter at a distance, it must do so through a medium. Now, the supposed medium of gravitating force, of light, and of heat, is reputed to be one and the same, viz. the surrounding ether. How is it, then, that the light and heat are diminished by the interposition of the moon; while the attractive force remains the same? The answer is plain. But, before answering, it will be of service to interline an explanatory remark. In the consideration of this difficulty, we find ourselves confronted with a certain number of pure theories. The existence of an ether is a theory; the undulations of ether, as explanatory of the phenomena of light and heat, are a theory. Under these circumstances, the phenomenon, which forms the groundwork of the present objection, loses its arguitive value, if it can be accounted for, in any way that is compatible with the indistance of a proximate Efficient Cause; particularly if the explanation is in conformity with the ideas more generally entertained by physicists of our own day. An interposed body, then,—to offer that which seems a reasonable solution,—may, or may not, obstruct the medium, through which the distant agent operates upon the Subject of its action. In the former case, it is a real impediment to the action of the agent and to the effect produced in the Subject. In the other case, it is as though it were not; since it neither hinders, nor co-operates with, either agent or medium, or else it co-operates, by a subordinate causality of its own, with the medium. To apply this distinction to the point in hand: In the phenomena of light and heat during a solar eclipse, the moon intercepts the motion communicated to the medium—the ether; and accordingly is a real impediment. But the attractive force of the sun, energizing through the same medium, is not intercepted. Does this seem probable, when the medium is precisely the same in all three cases? Surely; if the forces, communicated to the ether, are entirely distinct. But is it not, at all events, a gratuitous assumption? Certainly not. For, albeit light and heat are both supposed to be the result of undulations of ether, according to the modern undulatory theory; yet observation and experiment combine to show, that there is a marked difference between the two motions. Thus, for instance, the waves of light attain their maximum between D and E, (on the border of the yellow and the green), according to the lines of Fraunhofer; while the waves of heat

form an opposite curve of efficacy, and attain their maximum at 3, far beyond any sensible perception of light. Again:—and this is still more to the point,—there is a marked difference, and even opposition, between the two, in regard of their conductibility,—or rather, in regard of the bodies which serve as media or impediments of their respective undulations. It is observable, that precisely those bodies which are more conspicuously diaphanous,—such as glass, gases,—are the worst conductors of heat. This means, that the same body which allows the undulations of light to pass through it undisturbed, acts as an impediment to the undulations of heat. Since, then, the universal force of gravitation, which uses the same ether as its medium, is evidently more distant from the two forces of light and heat than these are from each other; it need occasion no surprise, if a body that is obstructive of the two latter should not be obstructive of the former. Furthermore: Since gravitation does not presuppose any undulations of the ether, but the ether is a pure medium for the passage of the attracting force, and since the same ether is supposed to permeate all corporal substance; it is far easier to understand how a body should offer no resistance to the passage of a force, while impeding, or even arresting, the oscillatory motion of the waves of ether.

II. The phenomenon of a lunar eclipse has supplied material for another objection. The earth either intercepts the attractive action of the sun on the moon, or it does not. If it does not intercept such action, it must act as a medium, and, in consequence, be subjected to an increased action of the sun,—viz. besides that which it normally experiences on its own account, the additional attraction which, as medium, it passes on, so to say, to the moon. But there is no perceptible addition to the gravitating force acting upon the earth, during a lunar eclipse. Therefore, the sun must act immediately on the moon, though at a distance from it.

Answer. The objection is precisely similar to the previous one; accordingly, the solution is the same.

III. Heat from a fire acts upon bodies at a distance. This is proved by experience. Let a person stand near a fire; so that the warmth is very perceptible. Let him then interpose a screen of some sort; and the sensation of heat will instantly

cease. From these facts we gather, that the intermediate air has not received any increase of temperature. In other words, the heat has passed from the fire straight to the person affected, without affecting the temperature of the intervening medium. Therefore, the fire acts upon the person aforesaid immediately and at a distance.

ANSWER. It is, first of all, to be remarked, that the result produced by the intervention of the screen tells against the objection, and in favour of the present contention. For, how can the interposition of a body put a stop to the action of the fire; if the fire acts immediately on the man? Further: The intervening air is not the medium of heat; but, according to the received theory, the circumambient ether. Accordingly, the same impediment, which would interfere with the action of the heat upon *the body of the man* behind the screen, would likewise interfere with the action of the heat upon *the air* behind the screen.

PROPOSITION CCLXIX.

It is a necessary condition of the action of body upon body, that the agent should be in true and proper contact with the immediate Subject of its action.

DECLARATION OF THE PROPOSITION:

It is obvious, that the present Thesis is a simple corollary from the two preceding. For, if bodies cannot act immediately on each other, when separated by a vacuum (if such a thing were possible), or by an intervening body; it is plain enough, that one body can act upon another body, only when it is in immediate contact with this other, or with some other body which, being in immediate contact with the Subject, is a fitting medium, or instrumental cause, of its efficiency.

PROPOSITION CCLXX.

The doctrine, established in the preceding Propositions, is confirmed by the authority of the Angelic Doctor and of Aristotle.

DECLARATION OF THE THESIS:

The Angelic Doctor, discussing the question, *whether the Resurrection of Christ is the Cause of the resurrection of our bodies*, makes the following noteworthy observation: 'It is in

the natural order of things, as Divinely instituted, that every cause whatsoever should first of all act on that which is nearer to it and, by means of the latter, on others more remote.' Here, a general principle is laid down, that, according to the natural order, proximity of the agent to the Subject of its action is a universal law of causality; and moreover that, according to the same order, an agent acts on entities more remote, through the medium of entities that are nearer to itself. In the context immediately following, St. Thomas affords an illustration of his meaning in the following terms: 'Just as the fire first warms the air next it; and, by means of the air, imparts warmth to distant bodies[1].' But he speaks more plainly and more directly to the point, in the following quotation. In opposition to the dogma which he is maintaining touching the Presence of God in all things, he proposes to himself the following objection: 'That is a nobler agent, which is capable of producing an effect in its absence, than one which cannot do it save by its presence. But God is the noblest Agent. Since, then, there are found certain entities acting, some by will and others by nature, which produce effects in their absence,—as the sun, existing in the sky, produces heat on the earth by an emission of its power, and as a king effects many things, by his ordinance, where he is not himself present; it seems as though God *à fortiori* is able to produce an effect in His absence. Wherefore, there is no need of His being *in* those things which He has made.' To this argument St. Thomas makes the following reply: 'That which acts by its absence is not the proximate, but remote, cause of that which is produced. For the power of the sun is first impressed on *the body that is in contact with it;* and so, in regular order, up to the most remote. And this power is its light, by which it acts upon these things below[2].' In

[1] 'Habet autem hoc naturalis ordo rerum divinitus institutus, ut quaelibet causa primo operetur in id quod est sibi propinquius, et per illud operetur in alia magis remota; sicut ignis primo calefacit aerem sibi propinquum, per quem calefacit corpora distantia,' etc. 3ª lvi, 1, *c.*

[2] '(2). Praeterea, nobilius agens est hoc quod potest producere effectum in absentia sua, quam quod non potest hoc facere nisi per suam praesentiam. Deus autem est nobilissimum agens. Cum igitur inveniantur quaedam agentia et secundum voluntatem et secundum naturam, quae in absentia sui producunt effectus; sicut sol in caelo existens, efficit calorem in terra per emissionem virtutis suae, et rex aliquis per imperium suum multa efficit ubi ipse non est prae-

another place he expresses the same doctrine more absolutely. 'It is necessary,' he writes, 'that every agent should be conjoined with that on which it immediately acts, and should come into contact with it by its own power. Accordingly, in the seventh Book of the *Physics* it is proved, that the Subject of motion and the cause of motion must be together[1].'

It would be a work of supererogation to illustrate, by quotations, the judgment of the Philosopher touching this question; since his proofs for the necessity of contact in the action of body on body, contained in the seventh Book of his *Physics*, have been given at length in the second *à posteriori* argument, which has been adduced in support of the *two hundred and sixty-seventh* Proposition.

PROPOSITION CCLXXI.

Although indistancy is a necessary condition of the action of a material Efficient Cause on its immediate Subject; nevertheless, it is practically certain, that the agent does not invariably act on the distant Subject by means of the body as by means of an instrumental cause, but serves itself of it as of a purely passive medium.

Declaration of the Proposition:

The declaration of the present Thesis really resolves itself into an explanation; since the truth enunciated is implicitly contained in the doctrine, already exposed in the solution of the preceding difficulties, touching the nature of the relation which the medium is capable of holding towards the principal agent. It is maintained, then, in this and the next Propositions, that a body intervening between the agent-body and the Subject-body may be either a purely passive medium, through which the Efficient Cause diffuses its energy continuously and, in this wise, acts upon the

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sens; videtur quod multo fortius Deus in absentia sui possit effectum producere; et ita non oportet quod sit in rebus quod condidit.'

'Ad secundum dicendum, quod illud quod agit per suam absentiam non est causa proxima ejus quod fit, sed remota; virtus enim solis primo imprimitur in corpore sibi conjuncto; et sic deinceps usque ad ultimum; et haec virtus est lumen ejus per quod agit in inferioribus.' 1 *d.* xxxvii, *Q.* i, *a.* i, 2^m.

[1] 'Oportet enim omne agens conjungi ei in quod immediate agit, et sua virtute illud contingere; unde in 7 Physic. probatur, quod motum et movens oportet esse simul.' 1^ae viii, 1, *c.*

distant Subject, or an instrumental cause subordinately, yet really and proximately, concurring towards the production of the effect. The probable existence of such a distinction, in the order of bodily causation, is inferred from facts of observation. An instance of the latter sort may be seen in the production of salmon and other fish; wherein, as already seen, the principal agent is only virtually present. On the other hand, take the case of a bowler in a game of cricket. It is only a part of the surface of the ball, that is in immediate contact with his hand; consequently, it is only that same part which directly receives the impelling force. Yet the motion, as is plain, is communicated to every portion of the ball, passing (as it were) from the part immediately moved, continuously on to the quantitative limit. It is not permitted to suppose that part acts on part, for two reasons; first, because impulsion is not effective of another impulsion, but of locomotion; secondly, because impulsion is effected by sharpness and strength of contact, which it is plainly impossible to suppose in potential parts of the continuous. It is natural, therefore, to infer, that the impulsion is exclusively given by the bowler to the whole ball, by virtue of his immediate contact with the part which is in unbroken continuity with the rest. Thus it would seem, that we have before us the example of a medium, passively receiving and transmitting the action of the principal agent. Another similar instance can be seen in the conduction of heat from the near end (subjected to the immediate action of the fire) to the far end of an iron bar.

The first-named species of medium will be considered in the next Proposition. For the present, therefore, we will limit our attention to the last. The instances that have been given, and many other similar ones that might have been added, leave little doubt that there are purely passive media of the nature described.

And, indeed, the existence of such media has a sort of *à priori* probability in its favour. For there is no body that is, or can be, in immediate contact with another throughout its entire mass, although becoming one with it all through, by virtue of the continuity. That one body, therefore, may be able to act upon another, it is not necessary that itself *wholly* should be in contact with the other *wholly*, (which is impossible); but it suffices that there should be a limit of some sort common to both, by virtue of which the agent may be able to act within the limits

of its own periphery, yet produce, by mere continuity of bodies, its effect in the Subject. This limit, as belonging to the Subject, is the medium through which the action of the agent passes, and is diffused throughout the periphery of the medium. Whenever, then, the action is intended by nature for the whole; it seems to postulate, that the limit should be a purely passive medium for the diffusion of itself throughout the continuous whole.

A word may be added, by way of assisting towards a discernment of these media in the phenomena of nature. When, then, the action is precisely the same throughout, being no other in the medium than in the Subject, and when the medium is homogeneous throughout,—as in the phenomena of gravitation, light, heat, electricity, galvanism,—and, finally, when, in addition, the primitive action of the agent is not augmented in its *quasi* transit through the medium; it is more probable, that the said medium is of the kind contemplated in the Proposition. When, on the other hand, the action is different or varied in the medium and in the Subject, by a variety of qualities or other terms of action; then it may be concluded, that the medium is a true instrumental cause. Thus, for instance, a pianist presses immediately upon the keys of his piano; and the motion passes, through a continuous medium, to the hammers. So far, the action is precisely the same throughout. But now the hammers, by proper contact and by transmitting the same imparted motion, convey it to the strings and wires; and these latter produce vibrations in the air, which become the causes of musical sounds. In this instance, the strings and wires are real instrumental causes.

PROPOSITION CCLXXII.

When the Efficient Cause acts upon a distant Subject, by means of an immediate Subject as its instrument; it does not necessarily act by means of the immediate Subject, as by an instrument disconnected with itself in causation. Hence, by one and the same action, it diffuses itself through the medium, and, together with the medium, acts upon the distant object.

Declaration of the Thesis:

The present, like the previous Proposition, simply needs explanation. As has been pointed out in an earlier Article of this Chapter, it often happens that the principal agent acts only

virtually, while the instrumental medium acts formally, on the distant Subject. For we know by experience of facts, that an agent, (after having communicated its virtue to the instrumental cause), is often absent and totally disconnected from the latter, or even no longer in existence, when the effect is produced in the Subject; as is the case with most living generations. The question arises, whether such is invariably the case, when a principal agent acts, through the intervention of an instrumental cause, on a distant Subject; or whether it may not sometimes occur that the agent, while acting through its instrument, concurs with the latter formally and directly in producing the effect.

Here, again, observation of the phenomena of physical causation points to a conclusion, in harmony with the Enunciation. While, as has been noticed more than once before, there is often complete disjunction between the principal Efficient Cause and the instrumental medium which is vicegerent of the former; there are, on the other hand, certain effects produced by a medium, only when it is in conjunction with the principal agent. Thus, for instance, the *actual* pressure upon the lever in a hydraulic press is necessary, in order that the water in the cylinder may receive and communicate, with multiplication of force, the requisite pressure. The action of the sun in the propagation of heat and light is apparently of the same description; as also the action of bodies on the senses of sight and hearing.

When, then, the action of the medium ceases, as often as the principal agent ceases to energize in connection with the former, and recommences, as often as the action of the principal agent is renewed; we may safely infer, that the latter formally and proximately concurs towards the production of the effect.

Hitherto, the subject of discussion, proposed in the present Section, has been considered exclusively in its relation to material agents. It now, therefore, only remains, that we should determine, whether the same law of indistancy holds good also in the instance of spiritual beings, or Intelligences, *servatis servandis*. For it is plain, that spiritual indistancy cannot consist in quantitative contact. The question is: Whether indistancy of some sort

is requisite, as a condition, in order that a pure Intelligence may be enabled to operate on bodies. Wherefore,

PROPOSITION CCLXXIII.

In order that a Spirit, or pure Intelligence, may be able to move a body locally; it is necessary that he should be immediately and substantially present to the body that is Subject of his action.

Prolegomenon I.

The existence of these pure Intelligences is, for the present, taken for granted. The question will be distinctly discussed later on.

Prolegomenon II.

Similarly it is here assumed, and will afterwards be demonstrated, that these Intelligences can exercise no other causality on bodies, than that of locomotion.

Prolegomenon III.

It is further necessary to the right understanding of the present problem, that a word or two should be premised touching the *ubication* of these Intelligences, only so far, however, as will suffice for the present need; for this very difficult question will be discussed at full, under the Category of *Place*. Thus much will be borrowed from a future Chapter. Each Intelligence has a definite sphere, to which his substantial presence is limited,—a sphere greater or less, according to his order of excellence. This substantial presence he can cause to be here or there, according to his will. It follows, that these pure Intelligences have a real ubication. But the ubication of a spirit differs in some important particulars from the ubication of a body. The ubication of a body is *circumscriptive;* that is to say, a body occupies a place in such sort, that it is wholly in the whole space, by virtue of each part being in a corresponding part of the same space. The ubication of a spirit is *definitive;* that is to say, a spirit occupies a place so, that he is wholly in the whole place, and wholly in every single part. Hence, it is free to him, either to be substantially present throughout his natural sphere, or to limit his presence indefinitely within this sphere. Again: The ubication of a body, in the order of nature, excludes

the possibility of any other body at the same time occupying the same place. The ubication of an Angel is compatible with the substantial presence of another Angel, or even of a body, even at the same time in the same place. Once more: A pure Intelligence has a real power of locomotion, though of an all but incalculably higher order than that of bodies. Accordingly, he can be substantially present with, and absent from, this body or that; and he can make himself present now to this body now to that, but only successively, unless both should be within the periphery of his own proper sphere. Lastly: The substantial presence of a pure Intelligence with a body essentially differs from the substantial presence of a body with the same. The latter is effected by immediate contact, which is possible only according to the unity of a common limit. Consequently, it is partial and imperfect. But the substantial presence of an Angel with any other entity is effected by mutual filling of the same place. Hence, it is adequate and complete.

DECLARATION OF THE PROPOSITION:

The truth, which is here maintained, has been already demonstrated by the first *à priori* argument, adduced in proof of the *two hundred and sixty-seventh* Thesis. Here, therefore, in harmony with the general plan and purport of the Work, the authority of the Angelic Doctor shall be invoked in confirmation. An examination of the passages, about to be quoted, will supply us with the clearest and most satisfactory declaration of the doctrine. In one place, St. Thomas moots the question: '*Whether Angels or devils can take to themselves a body;*' and he decides in the affirmative. But he proposes to himself the following objection: 'It is necessary that the entity which imparts motion should have some kind of influx into the body that is moved. But it cannot have any influx, unless it is, in some way or other, in contact. Since, then, there can be no contact between Angels and bodies; it would seem that they cannot move bodies and, consequently, cannot assume them.' This difficulty St. Thomas solves as follows: 'An Angel, when moving a body that he has assumed, introduces motion into it and touches it, not with a bodily but with a spiritual contact, by means of his active power[1].' Again: St. Thomas urges a fresh objection to

[1] '(11). Praeterea, oportet quod movens aliquid influat corpori moto. Non potest autem influere, nisi aliquo modo contingat. Cum ergo non possit esse contactus

his own conclusion: 'It may be said, that Angels cause locomotion in a body, exclusively by a mandate' of the will. 'But, on the contrary, that which causes motion and that which receives motion must be together; as is proved in the seventh Book of the *Physics*. Now, because an Angel elicits a mandate of his will; he is not, on this account, present together with the body that is said to be moved by him. Therefore, he cannot confer motion by a simple command.' To this objection St. Thomas replies in these words: 'The mandate of an Angel requires, that it should be carried into execution by his active power. Wherefore, there must be some sort of spiritual contact with the body that he moves[1].' In another place, the Angelic Doctor proposes the question: 'Whether devils have bodies, to which they are naturally united;' and he decides in the negative. Against this decision he brings the following, among many other objections. 'Nothing can act upon what is at a distance; unless its active power is conveyed to this latter by a medium. But the active power of a pure Spirit cannot be conveyed by a bodily medium; because a body is not capable of receiving the active power of a Spirit. Consequently, seeing that a devil acts on that which is distant; it would seem that he is not a pure spirit, but something made up of body and spirit.' To this difficulty St. Thomas makes the following reply: 'An Angel does not act immediately on any body, at a distance from himself; for, as St. John Damascene says, where an Angel is, there is his operation[2].' Once more: In another place, St. Thomas discusses the

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Angelorum ad corpora, videtur quod non possint movere, et per consequens nec assumere.'

'Ad undecimum dicendum, quod Angelus movens corpus assumptum influit ei motum, et tangit non tactu corporali sed spirituali, per suam virtutem.' *Pot. Q.* vi, *a.* 7, 11m.

[1] '(12). Sed dicendum, quod Angeli imperio solo movent corpus motu locali.—Sed contra, movens et motum oportet esse simul, ut probatur in 7 Physic. Sed ex hoc quod Angelus aliquid imperat voluntate sua, non est simul cum corpore quod per ipsum moveri dicitur. Ergo solo imperio movere non potest.'

'Ad duodecimum dicendum, quod imperium Angeli requirit executionem virtutis; unde oportet quod sit quidam tactus spiritualis ad corpus quod movet.' *Ibid.* 12m.

[2] '(15). Praeterea, nihil potest agere in aliquid distans, nisi virtus ejus per medium deferatur in illud. Virtus autem spiritus puri non potest deferri per medium corporale, quia corpus non est capax spiritualis virtutis. Cum ergo daemon agat in aliquid distans, videtur quod non sit spiritus purus; sed sit aliquid compositum ex corpore et spiritu.'

'Ad decimum quintum dicendum, quod Angelus non agit immediate in aliquod

question: '*Whether whatever an Angel does, he does by a mandate of the will;*' and he decides in the affirmative. But he urges this difficulty: 'It would seem as though not everything which an Angel does, he does by a mandate of the will. For the will is indifferent to the nearness or distance of its object. If, therefore, an Angel acted by a mandate of the will alone, it would follow that it could make no matter, whether the object on which he acts were near or distant; and so, there would never be any need of his coming down from heaven to earth, in order to do anything here. But this is against the tradition of Holy Scripture.' The following is his reply: 'The action of an Angel's will is rooted in his essence, from which proceed his active power and operation. Now, that which imparts motion must be *together* (in contact) with the moveable body that is moved by it; as is laid down in the seventh Book of the *Physics*. Therefore, it is necessary that the substance of the Angel should be, after some sort, in conjunction with the entities which it moves[1].' St. Thomas urges another objection: 'So far as the will is concerned,' he objects, 'there is no difference between one and a number; for just as one can will to move one thing, so he can will to move many things, or even the whole universe. If, then, an Angel acted only by a mandate of the will, it would follow that he could move the whole universe. But this is impossible; seeing that he is himself a part of the universe. Therefore, an Angel does not act by a mandate of the will only.' The following is his reply: 'Forasmuch as the action of the will is limited, proportionably to the essence; it does not follow, that an Angel is able to do all that he is able to will[2].'

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corpus a se distans; quia, ut Damascenus dicit, Angelus ubi est, ibi operatur.' *Ma. Q.* xvi, *a.* 1, 15m.

[1] '(1). Videtur quod non quidquid agit Angelus, agat per imperium voluntatis. Voluntas enim aequaliter se habet ad propinqua et remota. Si ergo Angelus ageret per solum imperium voluntatis, sequeretur quod non differret, ad hoc quod Angelus aliquid ageret, quod esset propinquum vel remotum illud in quod agit; et sic nunquam oportet quod de caelo ad terram descenderet ad aliquid hic agendum: quod est contra traditionem sacrae Scripturae.'

'Ad primum ergo dicendum, quod actio voluntatis angelicae radicatur in essentia ejus, a qua procedit ejus virtus et operatio: oportet autem movens esse simul cum mobili quod ab eo movetur, ut habetur in 7 Physic.; et ideo oportet substantiam Angeli aliqualiter conjungi rebus quas movet.' *Quol.* vi, *a.* 1, 1m.

[2] '(2). Praeterea, quantum ad voluntatem non differt unitas et multitudo; sicut enim aliquis potest velle movere unam rem, ita potest velle movere plures res, vel

Proceed we now to consider, in orderly sequence, the teaching of St. Thomas touching the present question; for in this teaching will be discovered an adequate declaration of the Proposition now under discussion.

i. It is worthy of observation, that the Angelic Doctor argues throughout on this assumption,—viz. that no agent whatsoever can energize on the Subject of its action, unless the two are *somehow or other* in contact, according to the possibility of their essential natures. This law, demonstrated by Aristotle in the seventh Book of his *Physics*, is the foundation of the doctrine of St. Thomas concerning Efficient Causality universally. He admits of no exception to it; and, in the above passages, refers twice to the conclusion of the Philosopher, and once to a parallel conclusion of St. John Damascene.

ii. He especially includes pure Intelligences under the general law; and maintains that, in order to be able to act upon bodies, an Angel must be in spiritual contact with them,—must be 'after some sort, in conjunction with the entities which he moves.'

iii. He explicitly denies, that a Spirit can act immediately on any body that is at a distance from himself; giving as a reason the general principle, that every agent must be in immediate contact with the Subject of his or its action.

iv. He teaches, that a pure Intelligence operates on bodies exclusively by an act of his will; and that it is by this act of the will, that he is *virtually* present with the Subject of his operation.

v. But does St. Thomas consider this to be an adequate explanation of the meaning which he attaches to *spiritual contact?* Evidently not. For he proposes the obvious difficulty that, if a Spirit could operate by a simple mandate of the will, he need not be in any sort of contact with the Subject of his operation; since he can will at a distance. His answer carries us a step further in the exposition of his doctrine. An act of the will is not enough, he replies, unless it is applied to the Subject by the active virtue of the Intelligence; and this supposes, because it postulates, spiritual contact.

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etiam totum universum. Si ergo Angelus ageret solum per imperium voluntatis, sequeretur quod posset movere totum universum; quod est impossibile, cum ipse sit pars universi. Non ergo Angelus agit solo imperio voluntatis.'

'Ad secundum dicendum, quod quia actio voluntatis limitatur secundum modum essentiae, non oportet quod Angelus possit agere omnia quae potest velle.' *Ibidem*, 2^m.

vi. But why so? Here we have arrived at the gist of the question. Can a faculty terminate in act, at a distance from the presential sphere of the substantial nature from which it flows? If it can; then the necessity for an application of the mandate of the will to the Subject of volition, by the intervention of an executive power, would not, of itself, necessitate the substantial presence of the agent. But St. Thomas expressly introduces this necessity for an application of the mandate; in order to meet the objection, that the universal law of mutual contact would be invalidated, if the doctrine were true, that pure Spirits acted by a mere mandate of their will. Hence, he evidently implies, that the application of the executive power of these Spirits essentially includes their spiritual contact with the Subject of their operation. Further: In the answer to the objection, he expressly asserts as much. But he does more than this; for, in the last two answers, he gives an *à priori* reason for the necessity of such contact, which supplies the foundation of the first *à priori* demonstration, offered in proof of the *two hundred and sixty-seventh* Proposition. (*a*) His first statement of the reason is as follows: '*The action of an Angel's will is rooted in his essence, from which proceeds his active virtue and operation. Now, the agent must be somehow conjoined with the Subject of its action. Therefore, the substance of an Angel must be in conjunction with the entities that it moves.*' The argument may be thus paraphrased. The action—or effect produced in the Subject—depends on the active virtue, or faculty. Both are rooted in the essential nature. As a consequence, the action belongs primarily to the essential nature, as to the principal agent. If, then, the effect, produced in the Subject, is the action of the substance; it is of necessity, that the substantial nature should be in conjunction with the Subject. Thus the Angelic Doctor, in this solution, virtually adopts the first and third *à priori* demonstrations in our *two hundred and sixty-seventh* Proposition. (*b*) His second statement is as follows: '*Forasmuch as the action of the will of an Angel is limited proportionably to the essence; he cannot do all that he is capable of willing.*' Here our first *à priori* argument is explicitly introduced. The limitation of the second act, or natural operation, of an Angel is in exact proportion to the limitation of its first act, or specific nature. If, then, an Angel is not by essence everywhere, he cannot act everywhere; and, wherever he acts, as

St. John Damascene says, there he must be in his substantial nature.

NOTE. It is observable, that modern fautors of the atomic and dynamic theories claim for the supposed elements of lifeless matter an excellency of action, which the teaching of the School denies to Angels, and—because of the metaphysical contradiction included in the hypothesis—denies to God Himself.

§ 3.

WHETHER IT IS A NECESSARY CONDITION OF THE ACTION OF AN EFFICIENT CAUSE, THAT THERE SHOULD BE A DISSIMILARITY BETWEEN THE AGENT AND THE SUBJECT OF ITS CAUSALITY: IF SO, IN WHAT PROPORTION?

There are two preliminary remarks to be made, which are necessary to a right understanding of the state of the question. The first is this: The whole discussion turns upon the similarity or dissimilarity existing between agent and Subject, antecedently to the causal action. For there can be no doubt that, when the effect is produced, a similarity is established between the two, as touching that which the one causes and the other receives. Every Efficient Cause, in proportion to its nature, energizes in the Subject of its causality, by introducing into the latter some either substantial or accidental form, similar to that which itself possesses; and accordingly, in the term of action, by the evolution of such form, it renders the Subject so far forth similar to itself. Thus, for instance, when fire has completed its causal action on the water; the result is, that the water is assimilated to the fire, by virtue of its evolved quality of heat. The second observation is, that this antecedent dissimilarity between agent and Subject need not necessarily be antecedent in order of time. It suffices that there should be an antecedence in order of nature. There is nothing to prevent the effect from being coeval with its cause; yet, supposing that such dissimilarity should prove to be a necessary condition of causal action, it must exist in priority of nature.

An answer to the question proposed shall, first of all, be given in the words, and with the paramount authority, of the Philosopher. The solution will afterwards be reduced to the form of a Proposition. 'In the next place,' writes Aristotle, 'something

has to be said of action and of passion. Now, there have been handed down to us, from those that have gone before, opinions mutually opposed' touching this matter. 'Still, the majority are unanimous in affirming this, at least, that like is incapable of becoming subject to the action of like, for the reason, that in no respect is the one more capable either of action or passion than the other, (for, to those things that are similar, everything is the same by similarity); but that things unlike and different are naturally active and passive in relation to one another. . . . It is consonant with reason, that what is like, and what is in all respects wholly undistinguishable, should in no wise be subject to the action of its like. For why should the one be active rather than the other? Or if anything is capable of being subject to the action of its like; it is also capable of itself becoming subject to its own action. And yet, if the case were so, there would be nothing incapable either of corruption or of motion; if, as is supposed, like *as* like is active. . . . . Since it is not any chance thing, that is of a nature to become Subject and to cause, but such things (whatever they may be) which either are opposites, or include opposition; necessarily, both agent and Subject are *generically* alike and the same, but *specifically* unlike and opposite. For body is naturally subject to the action of body, flavour to that of flavour, and colour to that of colour; and, generally, the homogeneous to the action of the homogeneous. The reason of this is, that contraries are all in the same genus. But opposites act on, and are acted on by, one another; so that necessarily the agent and the Subject are in one respect the same, and in another respect different from, and unlike to, each other[1].'

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[1] Περὶ δὲ τοῦ ποιεῖν καὶ πάσχειν λεκτέον ἐφεξῆς. παρειλήφαμεν δὲ παρὰ τῶν πρότερον ὑπεναντίους ἀλλήλοις λόγους. οἱ μὲν γὰρ πλεῖστοι τοῦτό γε ὁμονοητικῶς λέγουσιν, ὡς τὸ μὲν ὅμοιον ὑπὸ τοῦ ὁμοίου πᾶν ἀπαθές ἐστι διὰ τὸ μηδὲν μᾶλλον ποιητικὸν ἢ παθητικὸν εἶναι θάτερον θατέρου (πάντα γὰρ ὁμοίως ὑπάρχειν ταὐτὰ τοῖς ὁμοίοις), τὰ δ' ἀνόμοια καὶ τὰ διάφορα ποιεῖν καὶ πάσχειν εἰς ἄλληλα πέφυκεν. . . . τό τε γὰρ ὅμοιον καὶ τὸ πάντῃ πάντως ἀδιάφορον εὔλογον μὴ πάσχειν ὑπὸ τοῦ ὁμοίου μηθέν· τί γὰρ μᾶλλον θάτερον ἔσται ποιητικὸν ἢ θάτερον; εἴτε ὑπὸ τοῦ ὁμοίου τι πάσχειν δυνατόν, καὶ αὐτὸ ὑφ' αὑτοῦ. καίτοι τούτων οὕτως ἐχόντων οὐδὲν ἂν εἴη οὔτε ἄφθαρτον οὔτε ἀκίνητον, εἴπερ τὸ ὅμοιον ἢ ὅμοιον ποιητικόν. . . . ἀλλ' ἐπεὶ οὐ τὸ τυχὸν πέφυκε πάσχειν καὶ ποιεῖν, ἀλλ' ὅσα ἢ ἐναντία ἐστὶν ἢ ἐναντίωσιν ἔχει, ἀνάγκη καὶ τὸ ποιοῦν καὶ τὸ πάσχον τῷ γένει μὲν ὅμοιον εἶναι καὶ ταὐτό, τῷ δ' εἴδει ἀνόμοιον καὶ ἐναντίον· πέφυκε γὰρ σῶμα μὲν ὑπὸ σώματος, χυμὸς δ' ὑπὸ χυμοῦ, χρῶμα δ' ὑπὸ χρώματος πάσχειν, ὅλως δὲ τὸ ὁμογενὲς ὑπὸ τοῦ ὁμογενοῦς. τούτου δ' αἴτιον ὅτι τἀναντία ἐν ταὐτῷ γένει

It is in the last paragraph, that the Philosopher gives us his own proper conclusion touching the controversy; though from what he says subsequently, it is plain that he more or less adopts the opinion, quoted in the earlier paragraphs, as well as the arguments by which it was sustained. As usual, he is so concise in his style, that the reader will not be sorry to have, set before him, the paraphrase of the Angelic Doctor on the last paragraph, which is to the following effect: 'Aristotle says, then, that since not all things whatsoever are naturally capable of mutual action and passion,'—that is to say, of acting on, and in turn being acted on by, each other,—'*but only such as either are contraries or include contrariety; it is of necessity, that agent and Subject should be generically the same and alike, but specifically different and contrary.* Genus is not here taken in its logical signification; for, in this sense, other bodies would be of the same genus.' St. Thomas is here referring to the celestial bodies, which, in accordance with peripatetic teaching, he deemed to be of a higher order and, consequently, incapable of being subjected to the action of sublunary bodies. 'But genus is taken in its physical signification; and, so understood, all things which participate in the same matter are of the same genus. Now, that agents and Subjects are of such a kind, he proves by two arguments. First, he concludes it from induction, where he says: It is evident, that agent and Subject are of the same genus, and specifically distinct, by induction from singulars. For body is, by nature, subject to the action of body, which is of the same genus under the Category of Substance; if they have a common material derivation. This I say, because of the heavenly bodies, which have not the same matter in common with the inferior bodies. And flavour is, by nature, subject to the action of flavour, and colour to that of colour; both of which are of the same genus in the Category of Quality. And, universally, entities of the same genus' are subject 'to the action of their homogenes, that is to say, to physical entities that belong to the same genus. In like manner, he proves it thus: All things whatsoever, that mutually act and are acted upon, are contraries. But contraries belong to the same genus; as is proved in the tenth Book of the *Metaphysics.* There-

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πάντα· ποιεῖ δὲ καὶ πάσχει τἀναντία ὑπ' ἀλλήλων. ὥστ' ἀνάγκη πῶς μὲν εἶναι ταὐτὰ τό τε ποιοῦν καὶ τὸ πάσχον, πῶς δ' ἕτερα καὶ ἀνόμοια ἀλλήλοις. De Gen. et Cor. L. i, *c.* 7.

fore, agents and Subjects belong to the same genus; and, accordingly, they of necessity are in one respect alike,—for they are generically the same and alike;—and in another respect different and unlike,—viz. specifically[1].'

In consonance with the above teaching, follows

PROPOSITION CCLXXIV.

An Efficient Cause cannot act upon a given Subject, save in so far as this latter is dissimilar to it in form, or—to put it in other words—in that which is the term of action.

Prolegomenon.

By the *form* mentioned in the Enunciation, is to be understood generally the entity which is the effect produced in the Subject of action. Thus, for instance, heat is the form introduced into water by the action of fire. This will sufficiently explain, why it is likewise described as the *term of action.*

The Proposition is proved by the following arguments.

I. That which is in act is dissimilar from, and opposite to, that which is in pure potentiality to the same act. But an Efficient Cause operates, inasmuch as it is in act relatively to the form which it introduces into the Subject; and the Subject receives the effect, inasmuch as it is in potentiality to the same form. Therefore, etc. The *Major* is self-evident; for potentiality and act divide Being. Moreover: Act is potentiality fulfilled;

[1] 'Dicit ergo (Aristoteles), quod quia non quaecumque apta nata sunt agere et pati adinvicem, sed solum illa, quae sunt contraria, vel habent contrarietatem; necesse est quod agens et patiens sint (genere?) idem et similia, et diversa specie et contraria. Et non sumitur hic genus logice: quia hoc modo alia corpora essent ejusdem generis, sed sumitur genus naturaliter; et hoc modo omnia quae communicant in materia sunt ejusdem generis. Quod autem activa et passiva sint talia, dupliciter probat. Primo per inductionem, dicens, quod agens et patiens esse ejusdem generis et diversa specie patet inducendo in singulis: corpus enim natum et pati a corpore, quod est ejusdem generis in substantia, si tamen communicent a materia: quod dico propter corpora caelestia, quae non habent eamdem materiam cum inferioribus; sapor autem natus est pati a sapore, et color a colore, quae sunt ejusdem generis in qualitate; et universaliter res ejusdem generis ab homogeneis, id est a rebus naturalibus ejusdem generis. . . Ostendit idem similiter sic. Quaecumque agunt et patiuntur adinvicem sunt contraria: contraria autem sunt in eodem genere, ut probatur in decimo Metaphysicae: ergo activa et passiva sunt in eodem genere: et ideo necesse est ipsa esse qualiter (πῶς), id est quodammodo esse similia, quia eadem et similia genere; et qualiter, id est quodammodo altera et dissimilia specie, ut dixerunt antiqui.' *In loc. L.* i, *lect.* 19, *p. m.*

while potentiality is defect of act. The first Member of the *Minor* is plain; according to the common axiom, that *nothing can give that which it does not itself possess.* In order that the agent may be competent to produce a form in the Subject of its action; it must of necessity possess the form equivalently, at the least, in itself. The second Member is self-evident. Pepper, for instance, imparts to the soup, (which had it not before), that pungent aromatic flavour which is so well known. But then the pepper previously possessed this quality itself; otherwise, it could not have communicated it to the soup. The cock communicates to the fertilized egg the chicken-form; but it is capable of doing so, only because it is itself actuated by a like form.

In connection with the above argument, the following explanatory notes are added; which will serve to throw light upon the teaching contained in the quotation from Aristotle, and in the Commentaries of the Angelic Doctor.

i. When it is said that, in Efficient Causality, the agent is in act, and the Subject of operation in potentiality to the same form; the assertion must be exclusively understood of the form which is produced in the Subject by the agent, and received in the Subject from the agent. Hence, St. Thomas (commentating on the words of Aristotle in a later Chapter) observes: 'First of all, then, he premises a manifest principle, viz. that of entities one is in potentiality, and is passive; another is in act, and is active. This being so, there is no other cause of passion, save that what is receptive of a given form, receives this form from the agent[1].' Now, it is plain that the Subject must be in potentiality to the form; otherwise, it could not be in a condition to receive it. Even if it could be actuated by the same form twice,—which is impossible; it would still be in potentiality to the second actuation by the form. This is clearly exemplified in the Categories of Quantity and Quality, wherein *more* and *less* are possible. Thus, water by the agency of fire may have reached to 90° Fahr., but it is still in potentiality to any higher degree of heat; and the fire, possessing in act all these higher degrees, is capable, when duly applied, of

[1] 'Primo ergo praemittit quoddam principium manifestum, et est, quod entium, quoddam est in potentia, et illud est passivum; quoddam est in actu, et illud est activum; et, cum ita sit, non est alia causa passionis, nisi quia receptivum alicujus formae recipit illam ab aliquo agente.' *Ibid. lect. 23, init.*

producing them in the water. It will be seen from what has been said, that the potentiality and act may be either substantial or accidental. Further: That which has gone before helps to explain, why, and in what sense, privation has been reckoned among the causes of Being. For it is necessary to Efficient Causality, that the Subject, prior to its reception of the effect, should be without it; and because, being without it, the Subject is naturally capable of it and, as it were, postulates it in order to its own perfection, privation necessarily precedes generation and alteration.

ii. It is plain that, immediately antecedent to causal action, agent and Subject are in one respect alike, and in another respect unlike. Both agree in this, that they have a real potentiality for the form that is the term of causal action; they differ in this, that such potentiality in the Subject is a mere potentiality deprived of act, whereas in the agent the same potentiality has been reduced to act. But, since potentiality is that which is purely passive, while the form is in act, and since that which is purely passive is undifferentiated, while the act is differentiating; Aristotle asserts with reason, that agent and Subject are one and the same generically, but are specifically unlike and mutually opposed.

iii. In those instances in which agent and Subject are capable of changing places,—that is to say, in which each of the two entities (absolutely speaking) is capable of acting upon, and in turn of being acted upon by, the other; the genus must be physical, and not merely logical. In other words, the potentiality, common to agent and Subject, must be founded in one common nature. The reason is obvious. Unless the potentiality were physically the same; the form could not be physically the same, and there would be no possibility of interchange. Thus, the sun conspires to produce life in the plant; but, because there is not a like potentiality in both, the plant cannot produce life in the sun. In like manner, though the fire can produce softness in wax; the wax cannot produce softness in the fire. On the other hand, take the instance of billiard-balls. The object-ball, which receives motion from the player's ball, may in turn,—if the player so will it,—impart motion to the player's ball. But why? Because both balls, of their nature, are in the same physical potentiality to locomotion. It will be seen, that

such reciprocity of causal action is only possible, in the instance of *univocal* causes.

iv. In *equivocal* causes, this reciprocity of causal action is impossible. The Subject cannot re-act on its Efficient Cause, within that chain of causation wherein the cause is equivocal; because (*a*) the agent is of a higher order than the Subject, and consequently the genus of the two is not physically the same; (*b*) the Efficient Cause is not formally actuated by the form which it evolves in the Subject, but either equivalently or supereminently includes it in its own superior form.

v. As there is of necessity an unlikeness and opposition, in a certain respect, between agent and Subject, antecedently to the causal action; so it is a result of causal action that, in this very respect, agent and Subject are reduced to similarity and specific identity, according to the Scholastic axiom, that *an agent produces a likeness of itself.*

II. The second argument is based on the incongruities involved in the opposite opinion.

i. There would be no sufficient reason, why there should be any causal action at all. For Efficient Causality essentially consists in that, which may be truly characterized as a giving and a receiving. But, if the supposed agent and Subject of causal action are alike, and wholly undistinguishable in the given order of causation, there can be nothing for the agent to give; because there is nothing for the Subject to receive, which itself has not already.

ii. If we suppose the absence of any such differentiation between agent and Subject; there is no assignable reason why the former should act upon the latter, rather than the latter upon the former.

iii. There would be nothing to hinder an entity from exercising causal action on itself; on the contrary, it would be to itself the most ready and competent Subject. It would be the most ready, because absolutely inseparable from itself, and always at hand. It would be the most competent; because the similarity of a thing to itself is more intimate and complete, than its similarity to anything else.

iv. There would be no assignable limit or termination of an action. According to received teaching, action ceases with the introduction of the form, by which the Subject is assimilated to

the agent. But if, notwithstanding assimilation, causal action is still possible; seeing that there is no longer a producible effect other than that which has been already produced, there is no reason why the causal action should not go on for ever.

v. As Aristotle has remarked, in the passage quoted, if it were possible that there should be causal action, in the absence of any formal differentiation between agent and Subject; it would follow, that no entity whatsoever could be entitatively exempt from corruption or change. For every entity would be able to act upon itself, producing antecedent corruption and consequent generation. Further: In the given hypothesis, no entity—not even the supreme—could be exempt from subjection to motion and corruption, produced by external agency; since the possession of even infinite perfection would be no bar to causal action, and the infinity of perfection only serves to universalize similarity in being.

Corollary I.

It follows from the doctrine here evolved, that there must be a *generic* similarity between agent and Subject, even antecedently to the causal action; but the nearness of this likeness will differ, according to the nature of the cause. Univocal Efficient Causes postulate a more definite likeness in their Subject, than those which are equivocal. Again: Causes of substantial generation postulate a more definite likeness in the Subject of their action, than causes of mere alteration. Thus, horse produces horse, and daisy daisy; but fire and hot iron can both produce heat in water.

Corollary II.

The unlikeness between agent and Subject antecedently to causal action, which is essential to all physical efficiency of whatever kind, is such as exists between a form and its privation. Whatever other unlikeness may chance to intervene, does not pertain to Efficient Causality, as such, but to the special nature of the cause. The essential unlikeness here indicated satisfies the condition of *give* and *take*, which is absolutely necessary to all causal action.

Corollary III.

It follows from the preceding Corollary, that the agent must have a power over the Subject and, more particularly, over its passive capacity or potentiality.

Corollary IV.

Hence, in the natural order, two entities are incapacitated from standing in actual relation to each other of agent and Subject, in one of four ways: (i.) If neither of them possesses active power over the other; (ii.) If, in the one, there exists the causal power; but there exists, in the other, an incapacity for receiving the particular act which the former is capable of imparting; (iii.) If the one possesses the causal power, but the latter has already had its potentiality reduced to act; (iv.) Supposing active power on the one side and due receptivity on the other, together with the requisite unlikeness; if the Subject resists the causal action of the agent. Such resistance, however, must be complete; in order that it may offer an effectual impediment to the action of the agent. If the resistance is conquered by the superior virtue of the agent; the action becomes successive.

ARTICLE V.

The causality of the Efficient Cause.

In pursuance of the philosophical order which has been already adopted in the consideration of the preceding causes, it remains to determine the ultimate question touching the Efficient Cause, *as* Efficient Cause, independently of any specific determinations. What is that, universally, by which an Efficient Cause becomes causal in act? To put it otherwise: In what formally consists the causality of the Efficient Cause? What is that which essentially distinguishes it, as actual cause, from itself, as a purely potential cause? The question, as is plain, does not turn upon the relation that arises, as a consequence of the position of the effect; for such relation is posterior to, and presupposes, the causality. The causal action is the proximate foundation of the relation; and is, therefore, prior to the relation in order of nature. What is this actual causality? Such is the question that awaits us.

Now, an Efficient Cause may be said to produce a double effect. The one is positive; the other, privative. In generation, properly so called, the corruption of one substance precedes in order of nature the generation of another. The substantial form of the chrysalis recedes, as a necessary condition of the eduction

of the new substantial form of the moth or butterfly; as has been already said. Similarly, in accidental transformations, the evolution of one colour presupposes the desition of another; and even motion presupposes the desinence of rest. The subject of the present Article, therefore, comprises two distinct questions, touching these two effects attributable to an Efficient Cause. A separate Section will be devoted to each. In the first, the nature of Efficient Causality will be considered with reference to its positive effect; in the second, it will be considered with reference to its privative effect.

§ 1.

THE NATURE OF EFFICIENT CAUSALITY, IN RELATION TO ITS POSITIVE AND DIRECT EFFECT.

PROPOSITION CCLXXV.

The causality of the Efficient Cause, as a positive and direct effect, consists in nothing else save its action.

PROLEGOMENON.

Since, as will appear in the next Section, privative effects are not, in themselves, the result of direct causality; the present Thesis determines the nature of all Efficient Causality, properly so called.

THE PROPOSITION IS PROVED BY THE FOLLOWING ARGUMENTS:

I. The causality of an Efficient Cause is that which essentially constitutes it in act, and by virtue of which it is denominated an *actual* cause. But that by which an Efficient Cause is essentially constituted in act and is denominated actual, is its action; and nothing else. Therefore, etc. The *Major* is evident. The *Minor* is no less clear; nevertheless, let it be declared as follows: An Efficient Cause is constituted in act, by something which is supposed to be added, over and above the mere power of acting; for, considered exclusively as having a power of acting, it cannot be conceived as in act. Therefore, there must be something beyond the mere capacity of acting, which is absolutely and necessarily required, in order that the cause may be actually causal. But this *something beyond* is the action of the cause; nothing more, and nothing less. For, if the action is

subtracted, the cause neither is, nor can be conceived to be, energizing; if it be added, the cause is in act, and cannot be conceived as other than in act. But there is no other assignable entity whatsoever, which satisfies both these conditions.

II. The causality itself of each and every cause is that by which it proximately, adequately, and absolutely, attains its effect; and, moreover, by virtue of which the effect formally depends on its cause. But it is by its action alone, that an Efficient Cause proximately, adequately, and absolutely, attains its effect, and that the effect depends on such cause; for it is precisely this dependence of the effect in the Subject upon the cause, which formally constitutes action.

III. Another argument is based on exhaustive enumeration. It may be stated thus: Action is absolutely necessary to the causality of the Efficient Cause; and there is nothing else that can claim a like necessity. Therefore, etc. The first Member of the *Antecedent* is plain; and has been already declared in the previous arguments. The second Member is proved, as follows. If there is anything else intervening between the mere faculty of acting and the action itself, which is necessary to the causality of the Efficient Cause; it must be either something previous to the action, as though its root, or something subsequent to the action, as a result, or something concomitant with it. But neither of these hypotheses can be maintained, with any show of probability; and the enumeration is exhaustive. Therefore, etc. The first Member of the *Disjunctive* is thus declared. Whatever is previous to the action does not belong to the actual causality of the agent, but either to the mode of causality as touching the principiant, or to some requisite condition of causal action. This appears from the fact that, if we stop at this preparatory something,—whatever may be its nature,—the Efficient Cause is not yet cognized as actually causing; whether such arrest be made by an intellectual precision, or as a consequence of the suspension of the action by the free-will of the cause. But, once the action is cognized as there; it is impossible to conceive the cause as other than actually causal. The second Member of the *Disjunctive* admits of easy proof. For that which is subsequent to the action, is either the term or something posterior to the term. But these are, respectively, the primary

or the secondary effect of causality, not the causality itself formally and precisely considered *as* such; and it is thus we are now considering it. The third Member of the *Disjunctive* is no less easily declared. For any entity that is purely concomitant with the action, must necessarily be quite accidental to the action. Therefore, set on one side, the action still remains; and, as a consequence, the causality of the agent. The second clause of the *Minor* in the proof is sufficiently evident. For if there be anything that is not the action itself, in which the causality consists; it must either be before, or after the action, or concomitant with it.

IV. A confirmatory argument is derived from the insufficiency, and the unsatisfactory nature, of the other explanations that have been given. One of these explanations is; that the said causality consists in giving being to the effect. But this, however true in itself, is generic; for it is equally applicable to all the four causes. To the above explanation others have added, that Efficient Causality consists in giving being by effecting. But this opinion is substantially the same as that which is advocated in the present Proposition. For what is *to give being by effecting*, if not *to cause by action;* since *to effect* is identical with *to act?* There is yet another explanation. Fonseca maintains, that the causality, in reality, is no other than the entities themselves which are denominated Efficient Causes; not however conceived absolutely as they are in themselves, but as concurring towards the production of their effects. But, in the first place, this opinion seems to confound the *principium quod* with the *principium quo*,—the supposit or person that acts, with the form or faculty by virtue of which the supposit acts. Secondly, as Fonseca himself admits, the word, *concur*, is metaphorical; and certainly does not help to make things plainer. *Concurrence*, stripped of its metaphorical covering, resolves itself into two elements; viz. a capacity in the agent for producing the effect, (which is the *principium quo*), and the action of the cause. Thus the opinion of Fonseca is the same as the one which is here defended.

V. The truth of the Proposition is supported by the authority of the Angelic Doctor, who declares that 'the Efficient Cause is cause, inasmuch as it acts[1].'

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[1] 'Nam efficiens est causa, inquantum agit.' *In Met. L.* v, *lect.* 2ª, *v. f.*

DIFFICULTIES.

I. The action of the Efficient Cause is really the effect produced, as connoting dependence on the cause. But the effect cannot be identical with the causality of the agent; because the causality is the road (so to say) towards the effect. The argument is confirmed: Action, even formally considered, is itself an effect of the agent; since it flows from some faculty of this latter. Therefore, the action stands in need of a causality by which it may be produced.

ANSWER. The action is not, properly and formally speaking, the effect (which is entitatively in the Subject); but a mode of such effect, and really distinct from this latter. A proof of this is, that the effect can remain either without the said mode, or with a change of mode, (which comes to the same thing). Thus, heat remains in the water, after the fire has been put out; and the child lives on, after the death of its parents. If, however, we include under the term, *effect*, not only the form evolved, but likewise its dependence on the agent; it may be granted, that action is an effect of the cause. But much the same holds good, in the instance of all the causes that have been hitherto treated. The reason is plain enough. Causality always flows from the cause; of which it is, therefore, an effect. But it does not on this account follow, that the causality, as effect of the agent, itself requires another causality for its production; because it is of the nature of causality, that it should have an *immediate* connection with the cause, and that it should be intermediary between cause and effect. After a like manner, the term of motion is attained by means of motion. But the motion is not itself the effect of other motion; because it is the simple road, as it were, to the term *whither*.

II. When the action is over, the Efficient Cause remains. Therefore, the causality of the Efficient Cause cannot be identical with the action.

ANSWER. The *Antecedent* must be distinguished: *The Efficient Cause remains*, simply as an existing entity,—let it pass, (for this is not invariably the case); *it remains* as an Efficient Cause,—there is need of a subdistinction: Denominatively,—granted; really,—there is need of a second subdistinction: It remains potentially as an Efficient Cause,—let it pass; actually,—there is need of

a third subdistinction: Supposing a new action, terminated to a new effect,—granted; independently of any such new action,—denied.

III. The causality of the Efficient Cause cannot be outside of the Efficient Cause itself; as it is a mode intrinsic to it. But action is not intrinsic to the Efficient Cause. Therefore, etc. This argument is confirmed, by induction from the other causes that have been already considered; for, in both the material and formal causes, the causality is an intrinsic mode.

ANSWER. The causality of the Efficient Cause must be outside of the cause; for the reason, that the Efficient Cause is, in its essential nature, an extrinsic cause. When, then, the causality happens to be intrinsic, as in the instance of immanent actions; this depends upon the peculiar relation subsisting between agent and Subject, and is wholly accidental to the Efficient Cause *as such*. The assumed parity between the Efficient Cause and the material and formal causes is denied; because the latter are in their nature intrinsic causes, whereas with the latter it is the reverse.

IV. In creation there is true causality, as is plain; yet there is no action. Therefore, etc.

ANSWER. A complete examination of this difficulty is deferred, till the question of creation is *ex professo* under consideration. Meanwhile, let it suffice to say, that the first Member of the *Antecedent* is granted, and the second Member denied.

§ 2.

THE NATURE OF EFFICIENT CAUSALITY IN ITS RELATION TO PRIVATIVE EFFECTS.

In the preceding Section, Efficient Causality has been considered as communicating being, as producing a real form in the Subject. But, during the course of this Chapter, allusion has been repeatedly made to corruption, as a necessary concomitant of both substantial and accidental generation; and it has been made abundantly clear, that such corruptions are, in some way or other, real effects of the Efficient Cause. It becomes us, therefore, to determine the nature of the causality in regard of these privative effects.

PROPOSITION CCLXXVI.

No entity can be corrupted, or deprived of existence, by any real positive efficiency immediately productive of such effect; but the corruption, or privation of existence, of one entity is a necessary result of the production of another.

Prolegomenon.

There are, altogether, two ways in which an entity may cease to be. The first way is, when the non-existence of one thing follows, as a necessary consequence, from the new existence of another; as in the instance of all corruptions. This is the problem before us in the present Proposition. The second way is, when an entity immediately, and independently of the generation of some other, is deprived of being; and this case offers the problem to be discussed in the next Proposition.

I. The first member of the Thesis,—viz. that *no entity can be corrupted or deprived of existence, by any real positive efficiency immediately productive of such effect,*—is thus proved. Corruption, or deprivation of existence, is formally a non-entity. But real positive efficiency cannot be terminated to a non-entity. Therefore, real positive efficiency cannot be terminated to corruption, or deprivation of existence. The *Major* is self-evident; for corruption, as such, is the ceasing to be, of that which had been before. The following is the proof of the *Minor:* Real, or positive, action cannot immediately and absolutely be terminated to a non-entity. But positive efficiency is equivalent to positive action. The *Major* of this last syllogism is thus declared. All positive actions are either transient or immanent. As for transient actions, it is plain that these cannot immediately and absolutely terminate in a non-entity. For, in their case, the action is really and entitatively the effect produced in the Subject; yet connoting the intrinsic dependence of the effect on the agent. If, therefore, the action is real and positive, the effect must necessarily be real and positive; and, if the effect is not real and positive, it is metaphysically impossible that the action should be real and positive: For the simple reason, that the two are really one and the same. The truth is equally plain, in the instance of immanent actions. For either the term of an immanent action is something real and really distinct from the action (as some say);

or it is not really distinct from the action (as others maintain). Now, if the term (which is the effect) is real and really distinct, the effect is real and positive, as is plain; if, on the other hand, the term is not really distinct from the action, the positive reality of the action is *ipso facto* the positive reality of the effect.

II. The second member,—wherein it is asserted, that *the corruption or privation of existence of one entity is the necessary result of the production of another*,—is thus declared. In all corruptions, whether substantial or accidental, the desinence of the previous specific form—and this it is which constitutes corruption—arises out of the incompatibility of the two forms; that is to say, out of the natural impossibility, that the form of the corrupted substance and that of the newly generated substance should co-exist in the same body. To illustrate: It is impossible that the substantial form of clover and the substantial form of a sheep should exist together in the same body. Similarly: It is impossible that the same piece of wood should, at one and the same time, be round and square. Since, then, the two forms cannot co-exist in the same Subject; the presence of the new form postulates, as an essential condition, the cessation of the old form. Accordingly, the latter is said to be expelled by the former. The matter ceases to belong to the clover; because it is now under the substantial form of the sheep. The piece of wood loses its shape of roundness, by the fact of its having become square. Thus it is, that the same action, which directly evolves the new substantial form and constitutes the new substance, indirectly causes the expulsion of the previous form and the corruption of the old substance, as in some sort a partial effect or result. To take the instance, already given, from the art of carpentering: The block of wood is no longer round, as the result of its having been made square; yet it is perfectly plain, that the tool of the workman does not immediately and formally introduce *not-round* (which is a simple negation) into the wood, but effects in it the *square-form* (which is something positive).

DIFFICULTY.

The position, maintained in this Proposition, is at variance with facts of experience and the testimony of common sense. The poulterer and butcher directly intend, and effect, the death of the animals that they sell for food. Similarly, when one

man murders another, he directly intends and causes the death of his victim. But death is nothing more or less than a substantial corruption. Therefore, etc.

Answer. The difficulty owes its origin to a confusion of the physical with the moral order. It is *ethically* true, that the poulterer *intends* the death of his poultry, the butcher that of his beasts, and the murderer that of his victim. But real physical Efficient Causality knows nothing of intention, which belongs to the sphere of ethics. That which alone we have to consider here is, how the man *physically* executes his purpose. If this question is examined with care, it will be found, that the immediate and absolute effect produced, in these and all similar instances, is a certain displacement, or local change, either of the whole body or of one or other of its principal parts; in such wise that death, or the corruption of the animal substance, results as a natural consequence. But this displacement is a real positive effect. Consequently, these cases constitute no exception to the general rule.

PROPOSITION CCLXXVII.

Whenever an entity is deprived of existence, otherwise than as a consequence of the positive production or generation of another; such deprivation is not the effect of true Efficient Causality, but rather of an absence or privation of such Causality.

Declaration of the Proposition.

The truth, here enunciated, rests precisely upon the same basis as that of the preceding Thesis. For, if real Efficient Causality is terminated to a real positive effect; it is evident, that deprivation of existence is not the immediate and absolute effect of real efficiency. But, according to the hypothesis, it cannot be the mediate and indirect effect of such causality; because any action that could include such effect is excluded. Consequently, in so far as such privation has anything at all to do with Efficient Causality, it can only be attributed to the absence of such efficiency; for there is no other possible connection, besides these three that have been enumerated. Some examples will be of use, in assisting the reader to realize the doctrine here propounded. A man, we will say, is pumping; and the

water flows from the spout. The water suddenly ceases to flow; because the man, that was pumping, has desisted from his causal action. The water in the kettle ceases to boil; because the kettle has been taken off the fire, which, accordingly, no longer acts upon the water. Similarly, supposing that it should be the Will of God to annihilate any one of His creatures; He would execute His purpose, simply by withdrawing His Act of Preservation. To speak with all reverence: He could not do it by a direct positive Act of His Omnipotence; because this involves a metaphysical contradiction.

Corollary I.

In every instance of corruption, or loss of real being, there must intervene a change of some sort. So much is obvious; for the entity passes from a state of being to one of not-being, according to the nature and extent of the corruption. Thus, for instance, when the green gooseberry ripens and becomes red; the green colour (or rather the *green* gooseberry) is corrupted, and the berry passes from a state of green to that of not-green. But there is not always, of necessity, any causal action. Thus, for instance, the sky becomes dark after sunset. There is a change from light to dark; but there is no causal action producing the darkness. The causal action of the sun ceases; and, in consequence, the light ceases. In the order of nature this occurs exclusively with accidental forms; though *de potentia absoluta* it is likewise possible in the instance of substantial forms. It is, however, worthy of note that, when it is question of necessary causes, a previous action is always connoted. The reason is, that as necessary causes cannot themselves arrest their causal efficiency, when the due conditions are normally present; if such arrest takes place, it must be owing to the interposition of some real obstacle. But this obstacle postulates a real causal efficiency, by which it is produced. Thus, for instance, the sun does *not* light up the room, because the shutters have been shut; there is darkness at night, by reason of the motion of the earth. The case is different with free agents, who have the power of suspending their causal influx, by virtue of the dominion which they have over their own action; as will be seen later on.

Corollary II.

In every case wherein corruption, or loss of being, is the result of a positive action from which the corruption follows as an absolute and necessary consequence, some Subject is essentially presupposed, which Subject is common to the two terms of the change; for there is no incompatibility between two forms informing two Subjects. If, then, the existence of one form is incompatible with the co-existence of another; it must be, in the relation of the two to one and the same Subject. But, whenever corruption is the necessary consequence of real causality; it is, by virtue of the same incompatibility. This is the intimate reason, why it is metaphysically impossible that annihilation should be effected by positive action; for such action would be, so to say, the destruction of its own Subject. Either the annihilative action takes place in the Subject, or it takes place independently of the Subject. If it takes place in the Subject, the Subject remains, and accordingly is not annihilated; if it takes place independently of the Subject, then it can effect nothing incompatible with the being of the said Subject. Under neither of the two hypotheses, therefore, could annihilation ensue by means of direct causal action.

Corollary III.

'Whensoever corruption, or privation of entity, is the necessary result of positive action in the manner already explained; the action is physically one and simple, but involves two partial changes,—the one positive, the other privative. For a thing may be changed in one of three ways; as Aristotle lays it down, in the fifth Book of the *Physics*. First: The change may be, from the possession of a certain form to the loss of it. Here there is, indeed, a change; though not necessarily any action, (as has been already said), but a cessation of preservative action. Secondly: The change may be, from pure privation to the possession of some form; as, from darkness to light. In this case, as there is one simple action; so is there likewise one simple positive change. Lastly: The change may be from one form to another. In such instances, there is one simple action by which the form is evolved, that is newly introduced into the Subject; for there is no other action necessary for the expulsion of the old form. But there is a twofold change; for the given

Subject differs from what it was, in two ways;—in that it has lost the form which it had before, and in that it now possesses a form which it had not before. Now, these two changes are so distinct, as in fact to be sometimes separate. Further: The one is generation; the other corruption, either substantial or accidental. Lastly: The one is positive, the other privative. Hence, by how much information of the one form, and privation of the other form, mutually differ; by so much do these changes mutually differ. These two changes, however, can be called partial; because physically they constitute a single transition from one positive term to another, which in philosophy is denominated the conversion of one thing into another[1].' Thus much Suarez, who has been closely followed throughout this Article.

Corollary IV.

It is plain, from what has gone before, that the same causes, principal and instrumental, and the same conditions which are requisite and sufficient for the generation or production of the new entity, are requisite and sufficient for the corruption of the old; since the former is the effect, the latter is the result, of one and the same action.

Corollary V.

From the truth propounded in the preceding Corollary, we deduce a conclusion of some philosophical value touching the matter in hand. The new form, introduced into the Subject, does not *efficiently* cause the expulsion of the old form; since it is not the Efficient Cause of its own eduction, and of the generation of the new entity. But it *formally* causes the said expulsion; because its existence is incompatible with the presence of another form, as before said. This conclusion, however, has been contested by Soto, who adduces, in proof of the contrary, the instance of locomotion by propulsion. Two bodies, he urges, come into violent contact; and the one moves the other from the place it previously occupied. Here the moved body loses the place that previously belonged to it, because of the natural incompatibility of two bodies occupying the same place. It, moreover, acquires a new place; and, in order to acquire the new place, it must of necessity lose the old. Nevertheless, it loses its former place, by

[1] *Metaph. Disp.* xviii, § 11, *n.* 8.

the real positive action of the impelling body. The exhaustive answer of Suarez to this argument shall be given in his own words. 'When two bodies come into contact,' he writes, 'and one drives the other; the one that is driven off does not lose its place by mere ceasing to be there, but by a real change and tendency to another place, towards which it is effectively moved by the body that expels it. Wherefore, in this case there occurs not only the formal incompossibility of two bodies occupying the same space, but, in addition, a special positive action by which the body, driven from one place, is transferred to another; and such action is distinct from that, by which the one body is introduced into the place of the other. But it is otherwise, when a form, introduced in the same Subject, expels another. For that which has been expelled is not positively changed, but merely ceases to be privatively; and consequently, in such case, there cannot be the intervention of any special efficiency. In these instances, then, there is only *formal* expulsion. And, universally speaking, every cause in its own category concurs towards the not-being of the one term, according to the measure in which it concurs towards the being of the other. Accordingly, forasmuch as heat introduced into a Subject does not actively impart heat, but only formally; on this account, it does not expel heat actively, but formally only. But it is otherwise with the heat which is in the generating cause; for this latter is Efficient Cause of heat distinct from itself, and, as a consequence, expels the opposite cold. And, in the same proportion, though the heat produced in wood (and the same holds good of every like disposition) formally includes only the accidental form that is its opposite, yet by way of disposition it corrupts the substance itself, because by these means it causes the introduction of the opposite form; and, as has been declared, any one form concurs towards the not-being of the one term in the same category of causation, just as it concurs towards the being of the opposite term. Wherefore, because it belongs to the proper nature and efficacy of accident, that it should dispose for the reception of the substantial form which is connatural with it, and that it should formally expel the contrary disposition; for this reason it may be said, in this category, to corrupt substance by its own energy. If such accidents and dispositions of the Subject, in addition, concur effectively towards the eduction of their' substantial connatural 'form, in

the same category of efficiency they concur towards the corruption of the other; if they have no efficiency in relation to the former, neither have they in relation to the latter. Accordingly, it is universally true that those only are principiants of corruption, which are Efficient Causes of generation; when corruption is the result of positive efficiency[1].'

ARTICLE VI.

Necessary Efficient Causes.

Introduction.

We are now about to enter upon a question, or rather upon a series of questions, full of interest and moment. It is of the first importance to a student of the metaphysical science, that he should acquire a definite and philosophical concept of this primary division of Efficient Causes. Its intrinsic importance receives addition from the fact, that the discussions have so intimate and necessary a connection with human action. The necessity for a more than ordinary elaboration of proof and explanation, as well as of a copious statement and solution of objections, is peculiarly forced upon us at the present time; in consequence of the propagation of most pernicious opinions touching the nature and operation of the will (which form the fundamental subject-matter of ethics),—opinions which would have never acquired the popularity which they at present enjoy, even when backed by the latent influences that have conspired to this end, had it not been, that the study of metaphysics has fallen into such universal neglect.

Suarez and others have enlarged the division, by the addition of another member. To *necessary* causes and *free* causes, they have added *contingent* causes. As the nature of these distinct species of Efficient Causes will be discussed at length in separate Articles; it will here suffice to supply the reader with a more or less general description of the three. Necessary causes, then, or causes that act of necessity, are such as are determined by their nature to one determinate effect; and cannot naturally forbear from producing that effect, in presence of all the requisite conditions. Free Efficient Causes, on the other hand, are such

[1] *Metaph. Disp.* xviii, § 11, *n.* 10.

as are free to act or not to act, as they please, spite of the presence of all the requisite conditions. Those which have been called contingent causes comprise *Fate*, *Accident*, and *Chance*.

It remains to remind the reader, that the efficiency of the First Efficient Cause is excluded from the present consideration; for the same reason that has been already given in previous Articles.

And now, to limit the consideration to the immediate subject of the present Article: 'There are many meanings,' writes St. Thomas, 'attached to the term, *necessity*. For that is necessary, which cannot not-be. Now, this attaches to an entity, (*a*) In one way, by virtue of an *intrinsic* principiant, either *material*,—as when we say that everything composed of contraries must of necessity become corrupted,' (or, be liable to corruption); 'or *formal*,—as when we say that a triangle must necessarily have three angles that are equal to two right angles. Such necessity is in the nature of things, and absolute. (*b*) In another way it belongs to an entity not to be able not to be, by virtue of something *extrinsic*, either an *end* or an *agent;* by virtue of an end, as when one cannot, without the said thing, attain or conveniently attain some end,—for instance, food is said to be necessary for life, and a horse for a journey. This is called the necessity of the *end;* and is also sometimes denominated *utility*. It belongs to an entity by reason of an agent,—as, for instance, when one is forced by some agent in such wise, as to be unable to do the contrary. This is called necessity of compulsion[1].'

From this passage it is easy to collect a division of necessity. (i.) There is a *metaphysical* or essential necessity, which is *absolute*. Such necessity is derived from the intrinsic constituents of being. It is metaphysically necessary, that a substance, composed of contraries, should be *subject to* corruption. It is like-

[1] 'Necessitas dicitur multipliciter. Necesse est enim quod non potest non esse; quod quidem convenit alicui, uno modo ex principio intrinseco, sive materiali, sicut cum dicimus, quod omne compositum ex contrariis necesse est corrumpi; sive formali, sicut cum dicimus, quod necesse est triangulum habere tres angulos aequales duobus rectis. Et haec est necessitas naturalis et absoluta. Alio modo convenit alicui quod non possit non esse ex aliquo extrinseco, vel fine, vel agente; fine quidem, sicut cum aliquis non potest sine hoc consequi, aut bene consequi finem aliquem, ut cibus dicitur necessarius ad vitam, et equus ad iter; et haec vocatur necessitas finis, quae interdum etiam utilitas dicitur; ex agente autem hoc alicui convenit, sicut cum aliquis cogitur ab aliquo agente ita quod non possit contrarium agere; et haec vocatur necessitas coactionis.' I^{ae} lxxxii, 1, *c*.

wise metaphysically necessary, that a triangle should have three angles equal to two right angles. Again: It is metaphysically necessary, that the will should have an essential tendency towards good. This is not the necessity with which we are now dealing; and it may, therefore, for all present purposes be ignored. (ii.) There is a *physical* necessity, which arises out of the natural order or, as it is commonly called, physical law. This is of various kinds. 1. It may be due to an intrinsic constituent; and may attach either to the first or second act of Being. For the intrinsic constituent of being may be such, as to create a physical necessity for a substantial change. Thus, a composition of contraries physically necessitates *actual* corruption. It may attach to the second act, or to natural operation; and in two ways. For the substantial form may be of such a specific nature, as to cause a physical necessity of natural operation, when all the requisite conditions are normally present. So, again, the substantial form may, as the result of its specific nature, determine by physical necessity the specific nature of the effect actually produced. To illustrate: When fire is applied to dry wood under normal conditions; it is physically necessary, that it should ignite the wood. Again: It is physically necessary, that a plant should generate a plant; and it is physically impossible, that it should produce an animal. This twofold necessity it is, with which we have principally to deal in the present Section. 2. There is likewise a physical necessity, arising out of the action of an extrinsic agent; as, when a stronger man than you seizes hold of your arm, and with it inflicts a blow on another, or when a gaoler confines his prisoner in a cell. Both are included under the necessity of *coaction*. Locke distinguishes between these two; and calls the former *compulsion*, the latter *restraint*[1]. (iii.) There is a *moral* necessity. This may be either intrinsic or extrinsic. In the first place, it arises, when certain means are either necessary or, at the least, the most fitting for the end proposed. Then it is intrinsic. Or it may arise from the commands, menaces, etc., of some other in some way superior to the agent. This is extrinsic; and, with least propriety, can claim the title of necessity.

To revert to the division of physical necessity, with which we

[1] *Essay on the Human Understanding, B.* ii, *ch.* xxi, § 13.

are more particularly concerned at present: From what has been already stated it is plain, that, in the physical necessity of natural operation, there is a twofold determination of the Efficient Cause. A thing is determined to its act, so as to be incapable of not acting; and, further, in its operation it is determined to the production of one specific effect, however often the effect may be produced. Thus, fire will always produce heat; and a dog will always reproduce a dog. It is to this latter determination, that the Angelic Doctor is principally referring in the following quotation: 'It is in this, that the causation of the will and the causation of nature differ; viz. that nature is determined to one, but the will is not determined to one. The reason of this is, that the effect is assimilated to the form of the agent, by means of which the agent acts. Now, it is plain, that of one entity there is only one natural form, by which the said entity has Being. Hence, of such sort as is the entity, in such sort it operates. But the form, in virtue of which the will acts, is not one only, but many; forasmuch as there are many reasons (or motives) apprehended. Hence, that which is effected by the will is not of such kind as is the nature of the agent; but such as the agent wills and understands it to be. Wherefore, the will is principiant of those things which are capable of being thus or otherwise. On the other hand, of those things which are unable to be, save in one way, nature is the principiant[1].' The meaning of St. Thomas may be thus expressed. An agent acts, in virtue of some form. The agent (as has been often declared before) is the *principium quod*, or entity that produces the act, and to which, (as to the supposit), the act is attributed; the form is the *principium quo*, or entity by virtue of which the agent acts. Now, in natural operation, the integral substance energizes by means of its substantial form. But there can be only one substantial form of one substance. On the other hand, the

[1] 'Voluntas et natura secundum hoc differunt in causando, quia natura determinata est ad unum, sed voluntas non est determinata ad unum. Cujus ratio est, quia effectus assimilatur formae agentis, per quam agit. Manifestum est autem quod unius rei non est nisi una forma naturalis, per quam res habet esse; unde quale ipsum est, tale facit. Sed forma per quam voluntas agit, non est una tantum sed sunt plures, secundum quod sunt plures rationes intellectae. Unde quod voluntate agitur, non est tale quale est agens, sed quale vult et illud intelligit esse agens. Eorum igitur voluntas principium est, quae possunt sic vel aliter esse. Eorum autem quae non possunt nisi sic esse, principium natura est.' 1ae xli, 2, c.

effect is after the likeness of the formal principiant; consequently, as there is but one specific form, so likewise there can be but one specific effect. In the causal action of the will, the immediate form is a judgment of the intellect directing a choice of the will, which is capable of being determined, either this way or that, by a variety of opposite motives; so that the same object may appear to both intellect and will, expedient from one point of view, and evil or inexpedient from another point of view; or, as St. Thomas puts it, it is 'capable of being thus, or otherwise.' Hence, the will is not determined to one act.

PROPOSITION CCLXXVIII.

There are many Efficient Causes in the universe, which act of necessity, whensoever all the requisite conditions are present.

Declaration of the Thesis.

This Proposition is abundantly proved by facts of daily experience. Fire always burns, when applied to a fitting Subject under the normal conditions. Colours always produce their own specific effect on the sense of sight, in the same way. There is always a lunar eclipse, when the moon enters into the shadow of the earth; and there is always a solar eclipse, when the shadow of the moon is cast upon the earth. In a word, all the laws of nature, all astronomical predictions, presuppose the necessary action of physical causes, in presence of the necessary conditions. What these conditions are, forms the subject of the next Proposition.

PROPOSITION CCLXXIX.

The requisite conditions for the normal operation of necessary causes are six.

Declaration of the Proposition.

The six conditions are the following: (i.) The cause must be in possession of its integral virtue of operation; (ii.) There must be a Subject, capable of receiving the effect, and normally present to the cause; (iii.) In the instance of mediate causality, the medium between agent and Subject must be capable of being acted on by the agent, and must be entirely free to do its work as medium; (iv.) There must be no intervening impediment, of suffi-

cient power to neutralize the action of the cause; (v.) The Subject must be destitute of the particular form, which is the effect of the causality of the agent; (vi.) If any previous action, or a joint cause, is required for the production of the effect; these are necessarily presupposed. Let us consider each separately.

I. The first requisite is, that *the cause be in possession of an integral and sufficient virtue for the production of the effect.* This is self-evident; for the effect is the act of the cause. A man, immediately after a sharp illness, is not fit to run a race; because, for the time, he has lost his normal strength of body. The act postulates the faculty; and the integral act, the integral faculty. But the act is, in reality, the effect. Therefore, an integral effect postulates an *integral* faculty in the agent. But the agent must, in like manner, have a *sufficient* virtue for the production of the effect. The heat sufficient to make water boil is less than a third, in degree, of that which is required, in order to reduce mercury to the boiling-point. About three times as much as in the last instance, is necessary to melt silver; and half as much again, to melt cast iron.

II. The second requisite condition is, that *there must be a Subject capable of receiving the effect, or form, producible by the agent; and that it must be sufficiently present to the cause.* There are three distinct points in this condition. (*a*) There must be a Subject of some sort, in which the cause operates. The reason is, that no finite cause can create. *Ex nihilo nihil fit.* (*b*) It is equally plain, that the said Subject must be fitted to receive the effect producible by the cause; for a Subject not so disposed is tantamount to no Subject at all. Thus, the sun cannot cause a stone to grow; and the sweet odour of flowers could produce no sensation in the ears. (*c*) There must be a sufficient nearness of the Subject to the agent; because (as has been seen) all finite causality is limited, in its exercise, to a certain sphere. One stove cannot warm a city; and an orator's voice in the House of Commons, by the ordering of nature, cannot reach New York.

III. The third necessary condition is, that *in the instance of mediate causality,—that is to say, in all cases wherein agent and Subject are not immediately contiguous,—the medium between the agent and the Subject must be capable of receiving the action of the*

agent as its instrument, of transmitting such action to the Subject, and must be entirely free to do its work. If any one of these conditions is not realized; so far forth, the medium ceases *ipso facto* to be a medium. For instance: Glass is a bad conductor of electricity; a brass rod is a very good conductor. Wherefore, the electricity from the machine would have no sensible effect, if glass were the chosen medium; it would have its normal effect, with metal as its medium. A man cannot walk with paralyzed limbs, because the nervous and muscular medium is not free to act. So, water cannot *naturally* flow, through an upward pipe, to a reservoir on a higher level.

IV. The fourth condition is, that *there be no impediment, sufficient to conquer the efficiency of the cause.* This is illustrated by a fact of daily experience. A stone is thrown upwards in the air. According to the primitive impulse communicated, it may mount higher or lower. But, sooner or later, it reaches a point from which it commences to fall to the earth. The force of gravitation is acting upon the stone, from the time it leaves the hand; but is not strong enough, at first, to arrest the upward movement. After a little, however, it becomes the superior force; and is able to arrest the impulsion primitively given. In order, therefore, that an entity may become an absolute impediment to the efficiency of a necessary cause; it must have a power of resistance, at least equal to the activity of the cause. Hence, on the other hand, no cause can be master (so to say) of its operation; unless it exceeds in virtue every actual impediment. Thus, for example, the force of gravitation has no perceptible motive effect on a vase that is supported by a pedestal; because it is encountered by the superior resistance of the latter. In like manner,—to take an illustration from the ethical order,—a man is incapable of voluntary action, and is in consequence not morally responsible; if he is suddenly and *wholly* mastered, for the time being, by the outburst of some violent passion. Under such a conjuncture, his acts are indeed the acts *of a man;* but they are not *human* acts.

V. The fifth condition is, that *the Subject should not already be in possession of the form, which is the specific effect of the causal action of the agent.* For it is, physically at the least, impossible for a substance, at one and the same time and relatively to the same part (which in the given case would be the *formal* Subject),

to be informed by two forms that are specifically the same, and only differ numerically. Hence, the existence of the one form in the Subject would constitute an invincible impediment to the production of another similar form in the same Subject. Thus: When once water boils; any other fire, or additional fire, will not cause a double boiling. A Leyden-jar, that is already fully charged, is incapable of receiving additional electricity from the action of a thousand electrical machines. A horse cannot carry a man to London, who is already there. If a man is already in possession of his supreme good; there is nothing capable of adding to his essential happiness.

VI. The last condition is, that *if any previous action should be required, or any other prerequisite, in order that the agent may be able to produce the effect; such action or other prerequisite must be present.* This likewise is plain; for such prerequisite is necessarily included in the proximate disposition of the Subject. To illustrate: The desires of an irrational animal, though necessary causes, are not reduced to action; because there has been no sensile perception of the object. The psychical act of seeing is impossible; unless the organ of sight has previously received its impression from the object. The chemical combination of oxygen and hydrogen postulates the previous action of heat or electricity. In order that the will may be able to desire or choose an object, a previous intuition or judgment of the intellect is required; since the will, of itself, is blind.

DIFFICULTY.

The enumeration of the conditions, contained in this Proposition, is inadequate; because it makes no mention of joint causes. One horse, (we will suppose), cannot draw an omnibus. Two, therefore, are required. Accordingly, since the causal efficiency of one horse is not sufficient for the required effect; it is plain that the effect cannot be produced, without the help of a joint cause. Another illustration of the same necessity is to be found in the fact, that no creature, animate or inanimate, can act in any wise without the Divine Co-operation.

ANSWER. This condition is evidently contained in the first of those enumerated in the Thesis. In the former of the two examples, one horse has not, of itself, an integral and sufficient virtue of operation; so that the two horses together form one

integral and sufficient cause. The same is true of the latter instance. Finite being has no sufficient virtue of itself, without the co-operation of the First Cause, for any the slightest operation. Such is the case, as a general rule, in all instances of joint causation. It may possibly be urged, that there are occasionally instances of joint causality, wherein one of the two causes would, by itself, be sufficient for the effect. But, in such cases, either one does not really act, and there is no such thing as joint causation; or the action of either, or both, of the two Efficient Causes falls short of the fulness of the facultative capacity. In this latter hypothesis, the exerted causality of each (which is its integral *actual* virtue of operation) is not adequate to the production of the effect proposed.

PROPOSITION CCLXXX.

In such causes as act by a natural necessity, there does not exist any antecedent indifference touching the effect to be produced; which would be inconsistent with the said necessity of action, under the conditions already mentioned.

Prolegomenon.

Indifference, as understood in the present inquiry, may be said to be an intrinsic indetermination of the Efficient Cause touching either the production, or non-production, or nature, of the act produced, antecedently to its determination by the act itself. It admits of a triple application. As applied to the *faculty* of the will, it is identical with *formal* liberty,—a term that will be explained subsequently. As applied to an *act* of the will, it denotes the relation of the act to such faculty and, as a consequence, its antecedent contingency. But, in the third place, it is likewise applied to that practical judgment of the intellect, by which the will is guided in its choice. Here, however, a difficulty suggests itself. For it is not easy to understand, how there can be indifference in any whatsoever intellectual act; seeing that the intellect is not free in presence of its object, but is necessarily determined to the eliciting of its act and to the particular object represented by its act, so soon as such object normally presents itself, or is presented before it by the action of some other faculty. Yet, as will be shown later on, the indifference of the act of volition arises out of the indif-

ference of the intellectual judgment. How can this be? It is quite plain, that there can be no *formal* or intrinsic indifference in an intellectual act, for the reason just given. But there may be, and in the judgments of which we are now speaking there is, an *objective* indifference. To explain: The practical judgment of the intellect sets forth, in the object, various reasons of fitness or unfitness; — for instance, that it is pleasurable but morally noxious, that it is fitted for the attainment of the end proposed under certain conditions and circumstances, but unfitted to such end under other possible conditions and circumstances. In like manner, it often represents a means, not as necessary to the end proposed; but as indifferent, by reason (we will say) of its little usefulness and difficulty of attainment; while, at the same time, it discovers and proposes to the will other means more eligible, though still not necessary. Let us take an instance: A medical man has made up his mind to obtain a practice in a certain town. The intellect—let us suppose—judges, that it is quite feasible for him to gain a practice, by the strength of his own exertions. He has a few friends there; and his family is well known and respected in the neighbourhood. But there is another medical man, already established in the place, who has a considerable and growing practice, and is willing to dispose of it on moderate terms. Both are means towards the same end. Neither of them is exclusively necessary for the attainment of the end. Again: The intellect represents an object as desirable, but as not having any necessary connection with the volitive appetite. The will is not, therefore, necessitated in its tendency. Thus it is apparent, how the subjective liberty of the will is rooted in the *objective* indifference of the practical judgment. The term, therefore, is applied analogically to the latter, according to analogy of attribution of the first class. The judgment is called free; because it leaves the will a freedom of choice.

The Proposition is thus demonstrated:

I. There is nothing purposeless in the arrangements of nature. Means are adapted to their end; and nothing is admitted to a place in its complex organism, which is essentially incapable of contributing its quota to the development of the whole. But agents, which should be necessary causes and, at the same time, indifferent to the production or non-production of their natural act, would be useless, because necessarily inactive. The *Minor* is

evident. Such agents must remain undetermined; and, on this account, their causal capacity could not develope into act: For, as being indeterminate or indifferent, they could not be determined by the object; and, as being necessary, they could not be self-determined.

II. The hypothesis is a contradiction in terms. Therefore, etc. The *Antecedent* is thus declared. Necessary causes are such as are determined to the production of their effect, whenever the requisite conditions are verified. Consequently, to conceive that a cause is necessary and at the same time undetermined, is equivalent to conceive of a cause that is, at once, determined and indeterminate. Neither is it of avail to urge against the above argument, that a necessary cause may be generically or specifically determined, yet undetermined as to the individual act. For, first of all, even free agents (as will be presently seen) are determined generically. Then, secondly, neither generic nor even specific determination is enough for actual efficiency; because all being, and therefore causal action (which is being), is terminated to the individual.

DIFFICULTIES.

I. The first objection, urged against the truth of this Proposition, is derived from the well-known case of the donkey between two bundles of hay. In the hypothesis that the two bundles are in all respects similar, and indifferently present to the sensile perception of the animal; there is nothing of sensile goodness in the one, which is not possessed by the other. Consequently, there is nothing objective in the apprehension of the two, capable of determining the animal's choice. Either, then, the donkey must, of its own will, determine the choice; or its appetite cannot be reduced to act. Yet it is a necessary cause; as will be seen in the next Thesis. Therefore, some necessary causes are not determined to the individual effect.

Answer. First of all, it may be safely denied that such perfect equality, from every point of view, can be found in nature; for it would be more than difficult,—to allege no other possible inequalities,—that both should be equally present to sense and imagination. Secondly, if such an equality were physically possible; some circumstance or other would determine the choice. For instance, some person might be standing near one bundle,

and no one near the other; or the sun might be shining on one, not on the other; or one might be easier to get at. As the Angelic Doctor puts it: 'If any two goods are proposed to the desire, as equal in one way of looking at them; there is nothing to hinder the existence of some condition, contemplated in relation to one of the two, by which the one acquires a pre-eminence, and inclines the will to itself, rather than to the other[1].' Lastly, supposing there to be no foundation for discriminating between the two; in such case, it must be conceded that the animal, owing to a want of liberty of choice, could not determine itself to the one rather than to the other. But such inaction would not be due to any intrinsic indifference in the agent. It would be traceable to the absence of a necessary condition. In fact, the object is not duly presented before the senses of the brute, because of the repugnance between the equal claims of the two objects.

II. The second objection is taken from the nature of equivocal causes. It is experimentally evident, that an equivocal cause is indifferent to the production of various and, often, opposite effects. Thus, for instance, the sun is indifferent to the production of light, heat, as well as to chemical action. Heat itself, considered as a cause, melts, boils, produces excandescence, electrical currents, and decomposes. The most curious instance of all is found in the fact, that cold causes water—the same Subject—to contract up to 4° C., and after that to expand.

Answer. The assertion, that any necessary cause whatsoever is absolutely—that is to say, *in and of itself*—equally indifferent to the production of opposite effects, is categorically denied. The difference, and even opposition, of the effects produced by an equivocal cause may arise, either from a difference in the Subject, or from a difference in the constitution and conditions of the same Subject, or from the varying concurrence of other causes. Thus, for instance, the rays (or waves of ether) by which the sun produces the sensations of heat and light, and those by which it blackens chloride of silver, are not the same. That heat boils water, melts ice, makes metals excandescent, decomposes compounds, hardens clay, liquifies gas, is due to a diversity of

[1] 'Nihil prohibet, si aliqua duo aequalia proponantur secundum unam considerationem, quin circa alterum consideretur aliqua conditio per quam emineat, et magis flectatur voluntas in ipsum quam in aliud.' 1–2ae xiii, 6, 3m.

Subjects, or—as in the instances of ice and water—to various conditions of the same Subject. A satisfactory reason for the last phenomenon mentioned in the objection has not, we believe, been as yet discovered by physicists. But thus much may be suggested by the metaphysician, pending the physical solution. Assuming cold to be a real physical agent; it is, nevertheless, plain that cold at 4° C. and 0° C. are not one and the same cause, and that the Subject (the water) is not in the same conditions at the one degree, and at the other. That the phenomenon takes place only when water is the Subject, is probably due to some hitherto unknown property of the water. But this is certain, that, in all these cases, whenever a cause in all respects the same acts upon precisely the same Subject under the same conditions, it is necessitated to the production of the same effect. Therefore, there is no antecedent indifference.

III. It is in the last place objected, that physical causes, universally speaking, (although naturally determined to their *specific* effect), are nevertheless undetermined as to the *individual* effect. Thus,—to take an example,—it is true, that fire is determined to the production of fire (substantially) or of heat (accidentally); but it is not determined, by nature, to the production of *this* fire or of *this* heat in particular, more than of any other. So, a colour—or rather, the cause of such colour—is determined to produce its specific effect on the sense of sight; but it is not naturally determined to exercise *hic et nunc* its efficiency on the individual sense of such or such a particular man.

Answer. It may fairly be granted, that physical causes in general are undetermined in regard of the individual effect,—or better, the individuality of the effect; because they are necessarily determined by the Subject. But such indetermination is not indifference. It is one necessary condition of all actual causality, (as we have seen), that a Subject capable of receiving the effect should be normally present; and the Subject, as a passive potentiality, is material cause of the individuation of the effect. When this, as well as the other conditions are verified; the Efficient Cause is necessarily determined to its individual effect. Accordingly, such antecedent determination includes no indifference touching the acting, or forbearing to act, in presence of the object; or any indifference towards one object rather than another —such as is to be found in the appetitive faculty of a spiritual

nature. Lastly: From what has been said it is clear, that a purely physical cause, other than spiritual, has no power of self-determination, even as to the individuation of its act.

PROPOSITION CCLXXXI.

Every Efficient Cause, in so far as its operations are not subject to reason, acts of necessity, in presence of the aforesaid requisite conditions.

Prolegomenon I.

The modifying clause in the Enunciation, *in so far as its operations are not subject to reason*, is intended to extend the periphery of the Proposition; so as to include, not only the causality of inanimate things, the causality of plants and of animals, but likewise the causality of man, in regard of those faculties which he possesses in common with the former. In other words, it involves the assertion, that the vegetative and animal faculties in man *of themselves* are as necessitated to their act, in presence of the said conditions, as they are in plant or in animal; and the same is to be said of the magnetic and other forces, which man possesses in common with inanimate substances.

Prolegomenon II.

The same modifying clause is intended likewise to limit, in another direction, the periphery of the Proposition; and this limitation is implied in the words, *of themselves*, italicized in the last sentence of the previous Prolegomenon. In the question now before us, it is of great importance to distinguish between the intrinsic activity of the faculty, and its extrinsic guidance. In man, as a rational animal, the sight may be directed by the will to a particular object, and the locomotive power of the legs to a particular place for a particular purpose. But, in the former case, the will only (as it were) renders the object present; and, in the other case, so far as it is free, only directs the intention. As soon as the object is presented to the faculty of sight, the sense of vision is necessitated to its act; and, in like manner, as soon as the motor nerves have been excited from whatever cause, the muscles are necessitated to their locomotive act. What is here maintained, then, is this; that every non-spiritual faculty

is necessitated to its acts, *positis ponendis;* and that, consequently, no irrational animal has any real liberty of choice.

THE PROPOSITION IS THUS PROVED:

I. *By universal induction.* The daily experience of life bears witness to the general fact, that in all cases of inanimate and animate being, man only excepted, the agent is obliged by necessity to produce its effect, in presence of the necessary conditions. Under such circumstances, fire always burns; body always attracts body, according to fixed laws; planets always revolve round their centre; the sun always gives light and heat; plants grow, and bear seed of their kind; animals use their faculties of sense, and obediently follow the instincts and passions of their nature. In no single instance is fire naturally free to give, or not to give, heat,—to produce cold or heat, according to choice. The sheep, when it sees a wolf, instinctively flees away; even if there should be no possible danger of assault. Nay, more: In ourselves we discover this same determination to act, and to one specific act, in the instance of those lower faculties which we share in common with plants or brute animals. Indeed, some of our vital acts—such as the circulation of the blood, the process of digestion, the action of the senses in presence of their object, the breathing of the lungs beyond a certain limited period of arrest—are entirely beyond the control of the will.

II. The second argument is an *à priori* demonstration. Though liberty of action is *formally* in the will, (as will be seen later on), its root or source is to be found in the intellect alone; so that it is metaphysically impossible, that a non-intellectual faculty should be capable of freedom in its acts. But that agent which is incapable of freedom in its causality, acts of necessity. Therefore, etc.

DIFFICULTY.

Some, while adopting the truth of the Proposition generally, nevertheless make an exception in favour of the sensile faculty in man; while others extend the exception to the higher and more perfect orders of animals. The reason for this twofold exception seems to be this; that, in the sensile faculty of man *as such*, there is a *cogitative power*, and, in that of the upper orders of animals, an *estimative power;* both of which are capable (as has been explained in the second Volume) of forming a sort

of *imitation universal*, in relation to sensile objects. Thus,—to repeat once more the instance of St. Thomas,—a sheep flees from a wolf, not because it is this particular wolf, but because it is a wolf. Accordingly, the fautors of the aforesaid opinion see in these powers, (more particularly in the *cogitative power* of man), something approaching to an intellectual force. Explained after such fashion, the objection tells little against the Thesis. Either these powers are rational, or they are not. If they are of themselves in any true sense rational, the sensile appetite need not be necessitated in its action; if they are not rational, the sensile appetite under their control must be necessitated to its act. But such an answer, though it solves the objection, does not afford a satisfactory explanation of the entire question. Wherefore,

i. The *estimative force*, in the higher orders of animals, is in no wise really and truly rational; although St. Thomas describes it as a sort of foreshadowing or forestalling of reason, because of its capacity for forming a sensile universal. But facts go to show, that the faculty is not intellectual; because they prove, that the animal cannot distinguish the true from the false. The sheep flees from the wolf, when there is no danger. The hen will sit on eggs of another species, or on its own eggs, indifferently; and it will often brood over an artificial egg, much beyond the normal period of sitting. In these and similar instances it is plain, that there is no intellectual discernment; and, assuredly, there are not even the most distant traces of any exercise of free-will, or of any sort of reflex action.

ii. The same is to be said of the *cogitative power* of man, considered in and by itself. For though it is, derivatively at least, of a higher order than the corresponding faculty in a brute animal, and probably has a parallel excellence in its act; nevertheless, it is of the same nature with the animal faculty. Now, it is a patent fact of experience, that, in all the other faculties of the soul which we share in common with plants and animals, such faculties are necessitated to their act, (whenever the object is normally present, and the requisite conditions fulfilled), precisely as they are in irrational animals; although they owe their origin to the spiritual soul. The nutritive power, that of growth, the faculties of sense, the passions and emotions, act of necessity. *Of themselves* they act as necessarily, as the heart

beats, or the lungs breathe, or the stomach digests. It is not, then, reasonable to suppose, that this one faculty, which is likewise common to the brutes, should form a solitary exception to the rule. Moreover, not being a spiritual faculty, it can have no dominion over its own acts. It should, however, be carefully remembered, that we are considering the faculty as independently,—of itself,—producing its act; not as subject to the direction of the will. Hence, it is universally true, that every non-rational cause produces its effect of necessity. As Locke has curtly put it: 'Whenever thought is wholly wanting, or the power to act or forbear according to the direction of thought; there necessity takes place[1].'

PROPOSITION CCLXXXII.

Efficient Causes, whose operations are not rational, are in such wise necessitated to their proper act, that *de potentia absoluta* their natural action cannot be arrested, if all the requisite conditions are normally present.

Declaration of the Proposition.

It is here maintained, then, that not only has a necessary cause no intrinsic power to arrest its action, in presence of all the prescribed conditions; but that no other agent—not even God Himself (for such is really the meaning of the phrase *de potentia absoluta*)—can possibly prevent the production of its effect. The intimate reason of this assertion is, as follows: That which is a contradiction in terms, and that only, is impossible *de potentia absoluta*. But it is a contradiction in terms, that a cause, producing its effect of necessity, should be arrested in its action; unless either the necessary conditions are unverified, or there is some extrinsic impediment of sufficient energy to countervail the said action. But, when all the conditions enumerated in the *two hundred and seventy-eighth* Proposition are verified, as is supposed in the Enunciation; there can be no extrinsic impediment to hinder the causal action. Therefore, etc.

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[1] *On the Human Understanding, Bk.* ii, *ch.* xxi, § 13.

DIFFICULTIES.

I. Granting the truth of the Proposition and the cogency of the proof; the introducing of the question, at all, seems to be frivolous and useless. For it is true of all Efficient Causes, and not of necessary causes only; that, under the supposed circumstances, they must produce their effect, if no impediment should intervene from within or from without. There is no question here of self-determination; because this was treated in the preceding Thesis. Now, it is equally true of the human will,—perhaps, more so,—that no extrinsic impediment can interfere to arrest the choice of the will. For it must be remembered, that the execution of a deliberate choice of the will by one or other of the inferior faculties does not enter into the present difficulty. Such execution is the effect of a necessary cause, and is covered by the Enunciation. When, then, the will makes a free election; no extrinsic cause can arrest the act. The Proposition, therefore, applies equally to all Efficient Causality.

Answer. The doctrine, established in the present Thesis, does not apply to the efficiency of the human will; since even an extrinsic authority, without causal action in physical opposition to the effect, can arrest the effect, known under the name of the choice, election, decision of the moral agent. Without entering too minutely into an explanation of a doctrine that will occupy our attention further on; let it for the present suffice to say, that, since the will has the mastery over its own act,—that is to say, is self-determining,—it can be arrested in its choice by counsel, admonition, interior illumination, caused by an external agent; not, of course, when the election is an accomplished fact, but when all the conditions are present, and the will is in its first act relatively to its object. It may be said, indeed,—and said truly,—that counsel, exhortation, warning, interior illumination, etc., are results of the previous action of some other agent; and, accordingly, it may be urged, that this action is included in the last condition. But there are two conclusive reasons, why it should not be so included. The one is, that the action in question is not physically necessary to the actual causality of the will. The other is, that the presence of the previous effects from without does not necessitate the choice of the will.

II. If it be true, that no necessary causes can *de potentia absoluta* be arrested in the production of their effects, when all

the conditions are fulfilled; it would follow, that natural operations would be absolutely free from Divine Intervention, and that prayers to that effect would be a useless ceremony. Further: Miracles—such as the preservation of the three lads in the fiery furnace—would be a sheer impossibility.

ANSWER. The *Consequent* is denied. It will be proved in the Book on *Natural Theology*, that the Divine Concurrence is absolutely necessary, in order that any finite Efficient Cause may be enabled to produce its effect. Thus, in the given instance from the Scriptures, the fire did not produce its wonted effect on the three children; not by any positive arrest of its action, but simply because God did not concur with the natural efficiency of the fire. The first of the conditions, therefore, is wanting; for a finite cause has not sufficient virtue for the production of the effect proposed, independently of the Divine Concurrence with the causal action.

III. It is notorious that human agency, as well as the intervention even of inanimate things, can arrest the effect of a necessary cause, even in presence of the requisite conditions. Thus, a table arrests the effect of gravitation on the lamp which the said table supports. A man, or even a pincushion, can hinder the action of the magnet on a needle.

ANSWER. The *Antecedent* is denied. In the instances alleged, as well as in all other similar instances, one of the enumerated conditions is not verified. We find, on examination, that there exists the impediment of an equal or superior force, neutralizing the effect. As a fact, the action of these causes is not arrested; though it is neutralized. The gravitating force really acts upon the lamp without pause. So does the magnetic force act upon the needle. But, in the instance of both, there exists the impediment of a superior antagonistic force.

GLOSSARY.

A.

AEQUALITAS COMPLEXIONIS. A term apparently employed by St. Thomas to express the equality of proportion between the components of a compound body (which is postulated by the physical law of equivalent proportions), in order that the composite substance may be evolved. It is illustrated by what, in modern chemistry, is called the law of *quantivalence*. [See p. 83; and the *first* Appendix to the *second* Volume, p. 738.]

B.

BODY is either *dense* or *rare* (*rarefied*), according to relation of extension to the body which it informs, or to the adopted unit of measure. A DENSE BODY, is one whose extension is comparatively small; a RARE, or RAREFIED, BODY is one whose extension is comparatively great. Of the two terms *rare* and *rarefied*, the former expresses the native relative greatness of extension; the latter the accidental greatness of extension, caused by an extrinsic agent whether naturally or artificially applied. In like manner, the correlative of *dense* is CONDENSED. The action by which the extension of a body tends to its diminishment is called CONTRACTION, or CONDENSATION; that by which the same extension tends to its enlargement, is called DILATATION, or EXPANSION, or RAREFACTION.

C.

CAUSATION is the effect in the Subject, as formally connoting the Efficient Cause of its production. Among other Divisions, not necessary to enumerate here, it is either *immanent* or *transient*. IMMANENT CAUSATION is predicated of an effect which is produced in the cause itself, as its proper Subject. Thus, an act of the will is produced by the will in itself. TRANSIENT CAUSATION is predicated of an effect, which is produced in a Subject physically other than the Efficient Cause. Thus, the will produces an effect in the faculty of locomotion. [See p. 37.]

CHEMICAL COMPOUNDS are bodily substances which are evolved, according to known chemical laws, from the due combination of other less complex substances. These latter may be either simple or compound bodies. A SIMPLE BODY is one which may enter into combination with other bodies; but is, itself, intrinsically free from any such combination. In CHEMICAL COMBINATION, the combining bodies do not remain in their substantial nature; but their essential forms make way for the evolution of the new form of a new substance. Thus, the forms of *oxygen* and *hydrogen* do not remain after their chemical combination; but yield to the new substantial form of *water*. In MECHANICAL MIXTURE, on the contrary, the mixed substances remain in the integral perfection of their substantial nature. Thus, in *air*, *oxygen* and *nitrogen* persevere unchanged in their substantial integrity.

COMPOSSIBLE is predicated of two entities, between which there is no physical contradiction; so that absolutely they can co-exist in the same entity or supposit. Thus, *heat* and *cold* are COMPOSSIBLE in the same *bar of iron.*

COMPRODUCE is a verb, expressive of the joint production of two effects by one and the same causal action. COMPRODUCED, as the passive participle, denotes an effect produced conjointly with another effect by one and the same causal action. Thus, the same agent that produces the *impression in the wax*, COMPRODUCES the *hardening of the wax* by cooling. The *intellectual faculty* is COMPRODUCED with the *human soul.*

CONNATURAL is an attribute predicated of an entity, which either constitutes a given nature in union with another entity,—as, for instance, *body* and *soul* are connatural in *living substances*,—or belongs to it as a property,—as *locomotion* to *animals*,—or, at least, is complementary of its integral perfection,—as *redness* to a *rose*,—or, finally, is not out of harmony with it,—as *physical weakness* to *old age.*

D.

DICHOTOMIZE: To divide into two parts. [See DICHOTOMY, in the Glossary to the *first* Volume.]

E.

EMINENTLY is applied to an entity, which contains in itself that which is more than equivalent to the perfection which is *formally* contained in another entity. It, therefore, connotes that the said mixed perfection is not formally contained in the subject of its predication or modification. Thus, *vegetative* life is eminently contained in *animal* life. The *reasoning* faculty is eminently contained in the *intellect of an Angel.*

H.

HOMOGENES: Entities which are included under the same genus or kind. Thus, all *vertebrates* are physiologically *homogenes.*

I.

INCOMPOSSIBLE is predicated of two entities which cannot co-exist in real union. (See *Compossible.*) Thus, *animate* and *inanimate* are *incompossible.*

INDIFFERENCE: Absence of difference in such or such a line of abstraction. Thus, the *light* from the *moon* and from the *planets* is INDIFFERENT, relatively to its source and mode of transmission.

INDISTANCY: The negation of distance between two or more entities. Thus, there is INDISTANCY between the *body* and the *soul* of one and the same man. *Two bodies* in immediate contact are INDISTANT from each other. [See p. 398 and those that follow.]

INTEGRAL is predicated of an entity which possesses all that is naturally complementary to the essential perfection of an *integral whole.* TO INTEGRATE is to add the said complementary perfection. INTEGRANT is predicated of the said complementary perfection. Thus, *intellect* and *will* are INTEGRANT parts of the *human soul*, considered as an INTEGRAL whole. *Intellect* and *will* INTEGRATE the said *soul.* [See WHOLE.]

INTELLIGENCES, PURE: Angelic Natures of whatever class. They are called *pure*, because they are exclusively spiritual in their essence; and are, unlike human souls, complete in their intellectual substance, not being substantially united to matter. [See SEPARATED FORMS, in the Glossary, at the end of the *second* Volume.]

L.

LOCOMOTION: The motion of an entity from place to place. It is, therefore, a species of motion; *the* principal species, from which the concept of motion is primarily derived. [See pp. 236 and the following.]

M.

MECHANICAL MIXTURE: The physical combination of bodies in such sort, that these preserve their substantial nature and individuality. [See CHEMICAL COMPOUNDS.]

MORAL, MORALLY. It is not intended here to supply an exhaustive division of these, and their cognate terms; but merely to explain a sense, frequently made use of in the present, and preceding Volumes. The adverb, then, and adjective are frequently employed to signify: *According to the common judgment of men.* Thus, it is said: It is a *moral* certainty, or *morally* certain, that the English form of government will eventually become democratic: Such an opinion is *morally* universal.

MOTION is '*the act of an entity existing in potentiality.*' It is an act relatively to the past and present, but in potentiality relatively to the future. [See pp. 275–280; and more particularly pp. 310–313.] As LOCOMOTION (see this term in the present Glossary) is the primary species of motion, and all other kinds have received the name by a sort of analogical attribution, in which locomotion is the principal analogate; the nature of motion may be most easily and clearly explained, by considering the movement of a body from place to place. The body is primitively at rest, and its movement may be represented by a line. The movement stops; and this rest is represented by the point which terminates the line, as the prior rest may be represented (both for the sake of illustration, because there is an important difference between a *point*, as terminus of a line, and *rest*, as a term of motion) by the initial point of the line. The latter is the *terminus a quo* of motion; the former, the *terminus ad quem.* Between the initial and final points of the line, is the line itself; which virtually contains within itself an indefinite number of potential points. Take the line as representative of motion; and arrest the imagination at any one of these virtual points. The body in motion is in act, up to this imagined point; but is in potentiality to the remainder of the line. This illustration may help the reader towards understanding the force and truth of the peripatetic definition of motion. Motion is physical and metaphysical. PHYSICAL MOTION is such as is discoverable in real bodies. Touching the three kinds of physical motion and the four species of locomotion, given by Aristotle in his Physics; see p. 287 and the pages that follow. METAPHYSICAL MOTION is the transit of an entity from potentiality to act, and from act to potentiality. Thus, the evolution of *the substantial form of an irrational animal* from *the potentiality of the matter*, and *the process of a thought* from *the intellectual faculty*, are instances of metaphysical motion.

N.

NATURAL OPERATION: The second act of Being. The first is the act of constituted existence. It is necessary to understand clearly and definitely, in what this second act consists. Natural operation, then, is the *whole* course of action, by which a being tends towards the natural end of its existence; and connotes *all* those faculties, by means of which the said being is enabled to energize with this intent. It is not limited, therefore, to one particular course of action, or to a definite faculty, or definite class of faculties; but denotes all the actions, and connotes all the faculties, by which the particular nature works out the final purpose of its production. Thus, *the natural operation of man* denotes his *vegetative* and *sensitive*, as well as

his *spiritual actions*, and connotes their corresponding *faculties*; though principally including the higher actions and faculties. See the same Term in the Glossary to the *second* Volume. NATURE (as distinguished from *essence* and *being*) is *the principiant of natural operation.*

O.

OCCASIONALISM. Such is the name given to the *philosophy* of Malebranche, a disciple of Descartes. This French writer maintained, that the operations of nature are not due to the action of second causes, (which, according to him, do not exist), but exclusively to the action of God, Who takes occasion of the due presence of what we should call secondary causes with the subjects of operation, to produce, Himself, all natural effects. Because God is supposed to have bound Himself to the observance of this law (as it were) of *occasions*, this philosophical system goes by the name of *Occasionalism.*

R.

RAREFACTION. [See under BODY; and p. 330.]

REST. [See MOTION.]

RESULTANCE: The conjoint and indirect effect of a causal action. When a proposed effect essentially postulates another additional effect which accompanies the former; the effect is a production of causal action, the addition is a *result*, and follows by *resultance*. [See p. 105, and the following.]

S.

SECOND ACT. [See NATURAL OPERATION in this Glossary, and ACT in the Glossary of the *first* Volume.]

SEMINALES RATIONES: *Seminal reasons, causes.* The following is the explanation given of them by St. Thomas: 'It is plain, that the active and passive principiant of the generation of all living things are the seed from which all living things are generated. Wherefore, Augustine appropriately calls all the active and passive forces, which are principiants of generation and of natural changes, *seminal causes.* Now, such active and passive qualities can be regarded from a manifold point of view. For, in the first place (as Augustine has it), they are principally and primordially in the Word of God Himself, as Ideal Causes. In the second place, they are in the simple bodies of the material creation, in the which they were simultaneously produced in the beginning. Thirdly: They exist in those entities which are produced from universal causes in successions of time; as, for instance, in *this* plant, and in *this* animal, as if in particular causes': That is to say, these active and passive qualities, which at first indifferently and universally attached to the primordial constituent elements of the material universe (simple bodies), become differentiated in specific natures, and consequently, in individuals of each species. 'Fourthly: They exist in the seeds which are produced from animals and plants. And these, again, are compared to other particular effects, as the primordial universal causes to the first effects produced [1].' What is it that we learn from this declaration of St. Thomas? That the material universe 'is pregnant'—to borrow a saying of St. Augustine, quoted by the Angelic Doctor in the same Article—'with the causes of things that are coming to the birth.' Of these seminal causes, the Exemplar Cause is in the Mind of God, Which represents to Itself, not only all bodily substances actual as well as possible, but likewise their properties and qualities. Now, the complex perfection of the world was not

[1] I^ae^ CXV, 2, C.

intended by God to be limited to the results of the original creation; but was ordained to develope into a marvellous fecundity of orders, genera, and species of bodily natures, out of the elements as primordially created. Since this development was to be the work of nature, directed by the ordinary providence of God; it follows that these simple substances, together with their successive compounds, should have wherewithal to produce these combinations, and to pass on, to the different species gradually evolved, the power of continuing the process of higher differentiation up to the completion of the Cosmos. Accordingly, in the Divine Patterns of the visible creation, not only are the substances with their other accidents conceived and represented, but, in particular, certain active and passive qualities, which should be the universal principiants of all future combination. Such in the Divine Idea are the RATIONES SEMINALES. These REASONS, first realized in the simple bodies, the one foundation of the complex whole, became the as yet undifferentiated causes of subsequent combination and consequent differentiation. There was active faculty on the one hand, and receptivity of action on the other. As the progressive evolution mounted into life, this active and receptive faculty developed into sexual differentiation, which was conservative of specific natures. Then it was that these faculties were respectively communicated in rich abundance to the sperm-cells and germ-cells, which thus became reproductive of individuals within the limits of a given species. In this way, the universal was differentiated down to the individual of a specific nature. The narrow limits of a Glossary forbid a further enucleation of this doctrine. It is hoped that enough has been said to show the mind of St. Thomas. [See the *first* Appendix to the *second* Volume, nn. III, IV.]

SUBSTANCES, SIMPLE and COMPOUND. [See CHEMICAL COMBINATION.]

T.

TEMPERAMENTUM COMMIXTIONIS: In proportion to the relative nobility of the substantial form of a body, the composition of the material part of the substance becomes more complex; as may be seen in the difference between inorganic and organized bodies. The bodies, informed by animal life, postulate a higher and more complex organism than those of vegetative life; and, of the former, those of higher grades postulate a more complex organism than those of comparatively lower grades. But the more complex the organism; the more complex, (as a rule), the chemical combination. Hence arises the peculiar instability of highly organized bodies. In such cases there is naturally required a delicate interlacing of constituents, and a series of virtual relations among the active and passive qualities, necessary to the functions of life, which seem to be represented by the term, TEMPERAMENTUM COMMIXTIONIS. [See p. 82.]

U.

UBICATION. This term may roughly, and in its widest signification, be described as the *place*, or *placing*, of an entity. The more careful examination of the term is reserved for the Chapter that will deal with the Category of *Place*. For the present let it suffice to say, that this term principally embraces material substances, or bodies; but that it likewise applies to pure Spirits. As applied to bodies, it is called CIRCUMSCRIPTIVE; for it limits place to the periphery of the body placed, and partakes of the nature of this latter. Hence, since the body is composite, the ubication is composite; inasmuch as each actual or virtual *part* of the body has its own actual or virtual *place*. To this source is due *position*, as properly applied to the body itself, apart from its local relation to other bodies. As applied to pure Intelligences, it is called DEFINITIVE; forasmuch as it defines the will and power

of a Spirit to the place which is occupied by the material substance, on which he is acting. The former kind of *ubication* is exclusive of any other ubication of the same nature; the latter is not.

V.

VIRTUAL is opposed to *actual*. It consists of two elements, viz. a negative, and a positive element. Negatively, it excludes an entity; positively, it includes the equivalent of this entity. Thus, *man* has not an actual, but a virtual *vegetative soul;* that is to say, he has but one soul, that soul however is equivalent to a vegetative soul, since, by the help of its lower faculties, it exercises all those functions which a vegetative soul exercises in plants.

VITAL SPIRITS: Apparently, a force of material life, which is distributed throughout all the vital parts of the body, but pre-eminently in the reproductive cells. This may possibly account for those phenomena of life, which modern physiologists have attributed to solitary and undifferentiated cells.

W.

WHOLE. [See this Term in the Glossary of the *second* Volume.] As this word has been explained already in a previous Glossary, it will be only necessary to explain two other wholes which appear in the present Volume. A POTENTIAL WHOLE is one that not only includes the generic or specific nature (the CONCEPTUAL and METAPHYSICAL WHOLES) in its representation, but likewise the essential faculties and properties of such genus or species. The *metaphysical whole* includes in its representation only the specific essence,—as, for instance, *man* is a *rational animal;* the *potential whole* includes, together with the essence, the faculties which are properties of the essence, but form no part of the essence itself,—as, that *man* is a *rational animal*, endowed with the *faculties* of *intellect and will*, as well as those of *animal and vegetative life*. An INTEGRAL WHOLE represents under its concept all the integrating parts of its Subject. If the Subject of the *integral whole* is a specific nature, the *integral whole* becomes identified with a *potential whole*. If the *integral whole* represents the integrating parts of an individual, it becomes identified with a *physical* or *individual whole*. With this latter, *as such*, Science has *formally* nothing in common.

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BY

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